Rocky Flats Environmental Technology Site

B771 AND B774 HAZARDS CHARACTERIZATION REPORT

BUILDING 771 CLOSURE PROJECT

REVISION 0

June 12, 2001

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ACRONYMS/SYMBOLS

ACM	Asbestos containing material
Am	Americium
CA	Contamination area
CCR	Code of Colorado Regulations
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CDPHE	Colorado Department of Public Health and the Environment
$DCGL_{EMC}$	Derived Concentration Guideline Level - elevated measurement comparison
$DCGL_{W}$	Derived Concentration Guideline Level - Wilcoxon Rank Sum Test
D&D	Decontamination and Decommissioning
DDCP	Decontamination and Decommissioning Characterization Protocol
DOE	U.S. Department of Energy
DPP	Decommissioning Program Plan
DQA	Data quality assessment
DQOs	Data quality objectives
EPA	U.S. Environmental Protection Agency
FDPM	Facility Disposition Program Manual
HVAC	Heating, ventilation, air conditioning
IHSS	Individual Hazardous Substance Site
K-H	Kaiser-Hill
LBP	Lead-based paint
LCS	Laboratory control samples
LSDW	Life safety disaster warning
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDA	Minimum detectable activity
MDC	Minimum detectable concentration
NORM	Naturally occurring radioactive material
NRA	Non-Rad-Added Verification
OASIS	Oxford Alpha Spectroscopy Integrated System
OSHA	Occupational Safety and Health Administration
PARCC	Precision, accuracy, representativeness, comparability and completeness
PCBs	Polychlorinated biphenyls
PDS	Pre-demolition survey
PDSP	Pre-Demolition Survey Plan
Po	Polonium
Pu	Plutonium
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RFCA	Rocky Flats Cleanup Agreement
RFETS	Rocky Flats Environmental Technology Site

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RFFO	Rocky Flats Field Office
RLC	Reconnaissance Level Characterization
RLCR	Reconnaissance Level Characterization Report
RPD	Relative percent difference
RSP	Radiological Safety Practices
TBD	Technical basis document
TSA	Total surface activity
UBC	Under Building Contamination
V&V	Verification and validation

EXECUTIVE SUMMARY

This Hazards Characterization Report summarizes the physical, radiological and chemical hazards associated with Buildings 771 and 774. Hazards were characterized based on historical reviews, process knowledge, and newly acquired characterization data. Environmental media beneath and surrounding the facilities were not within the scope of this characterization. Detailed information on facility hazards is also presented in the Building 771/774 Reconnaissance Level Characterization Report (RLCR), dated August 8, 1998, and summarized in this report. Hazards associated with the other 771 Closure Project facilities (i.e., outbuildings, trailers and exterior tanks) are presented in Attachment D to this report, Reconnaissance Level Characterization Report (RLCR) Supplement, Type 1 and Type 2 Facilities, 771 Closure Project, February 23, 2001.

Both facilities contain radiological contamination above the release limits prescribed in DOE Order 5400.5 and the RFETS Radiological Control Manual. Radioactive contamination is present on surfaces (e.g., floors, walls and equipment) and in equipment and building systems (e.g., gloveboxes, process tanks and lines, and ventilation ducts/plenums). Some areas and equipment/systems have high levels of radioactive contamination. Also, radiological hazards are associated with the presence of in-process nuclear material, nuclear material holdup, other radioactive materials (e.g., containerized special nuclear material and calibration sources), and radioactive and mixed waste.

Some chemical hazards are present in both facilities, including the following:

- Asbestos is present in both friable and non-friable forms;
- Silica is present in concrete;
- Beryllium contamination is present on one tank (i.e., Tank 1A in B774, Room 202) and may be present in process equipment, process lines, and exhaust ventilation (e.g., Plenum FU2 in B771, Room 249, and the main plenum in Room 283);
- PCBs are present in some applied paints (i.e., on several walls and floors within the B771 and B774 Contamination Areas, and within the 771/776 Tunnel), in some of the fluorescent light ballasts, and potentially in a variety of other materials, such as other electrical components, electrical cable insulation, rubber and plastic parts, gaskets, caulking, coatings, adhesives, and plasticizers;
- PCBs may be present in some equipment (e.g., in oils within hydraulic systems);
- Lead may be present in older electrical components, including some incandescent lamps;
- Lead may be present in applied paints, however, only one sample out of 61 had a lead concentration exceeding the RCRA hazardous characteristic level (i.e., one of the four paint samples taken from the exhaust tunnel);

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- Lead shielding is present in the form of plates, lead-lined gloves, and lead-lined glass windows;
- Mercury may be present in older electrical components and thermal instrumentation, including some fluorescent lamps;
- Toxic metals may be present in some process equipment, tanks, and process lines, and in waste containers;
- Chromates may be present in cooling water systems, including water-wall systems;
- Acidic and basic (caustic) solutions, and reactive acidic salts may be present in some process equipment, tanks, and process lines, and in waste containers;
- Organic solvents may be present in containers as product and waste, and may be present in process equipment, including tanks, process lines, and oil reservoirs;
- Other hydrocarbons such as oils, grease and other petroleum lubricants are present in containers as product and waste, and in process equipment (e.g., oil reservoirs); and
- Choro-fluoro-carbons (CFCs) such as freons are present in cooling and refrigeration units, including HVAC equipment.

Foundations of both facilities could have been contaminated by Individual Hazardous Waste Sites (IHSSs) and Under Building Contamination (UBC). Impacts will be defined during future investigation of the UBC and IHSSs, in-process characterization and the Pre-Demolition Survey, and/or characterization of demolition debris when building foundations are removed.

Physical hazards associated with the two facilities consist of those common to standard industrial environments, and include hazards associated with energized systems, utilities, compressed gas, diesel fuel, and trips and falls. There are no unique hazards associated with the facilities. The buildings have been relatively well maintained and are in good physical condition, and therefore, do not present hazards associated with building deterioration.

After equipment has been removed from the facilities and the facilities have been decontaminated, the demolition of these facilities will generate primarily uncontaminated rubble/structural construction debris, sanitary waste, and low-level radioactive waste. Most process-related equipment items, including ventilation systems, gloveboxes, and machinery are likely to be disposed of as radioactive waste. The Site plans to recycle most or all of the uncontaminated rubble/structural construction debris. Relatively small amounts of hazardous, toxic and asbestos-containing waste are anticipated.

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1.0 INTRODUCTION

As part of the Rocky Flats Environmental Technology Site (RFETS) Closure Project, numerous facilities will be removed. Among these are Buildings 771 and 774, which are the two major facilities within the 771 Closure Project and are addressed in this Hazards Characterization Report. . Their locations are highlighted in Exhibit 1-1. These facilities no longer support the RFETS mission and need to be removed to reduce Site infrastructure, risks and/or operating costs

Before the facilities can be removed, hazards must be identified. Identified hazards will be used to plan facility decommissioning and to dispose of related wastes in a compliant manner. This document presents the existing physical, radiological and chemical hazards associated with the facilities, and classifies the facilities pursuant to the RFETS Decommissioning Program Plan (DPP; K-H, 1999). Hazards characterization is based on facility history and process knowledge, operating and spill records, and results of field characterization (i.e., radiological surveys and scans, and radiological and chemical sampling and analysis). Information on facility hazards, based on facility history and process knowledge, is also presented in the Building 771/774 Reconnaissance Level Characterization Report (RLCR), dated August 8, 1998. Hazards associated with other 771 Closure Project facilities (i.e., outbuildings, trailers and exterior tanks) are presented in Attachment D to this report, Reconnaissance Level Characterization Report (RLCR) Supplement, Type 1 and Type 2 Facilities, 771 Closure Project, February 23, 2001.

1.1 Purpose

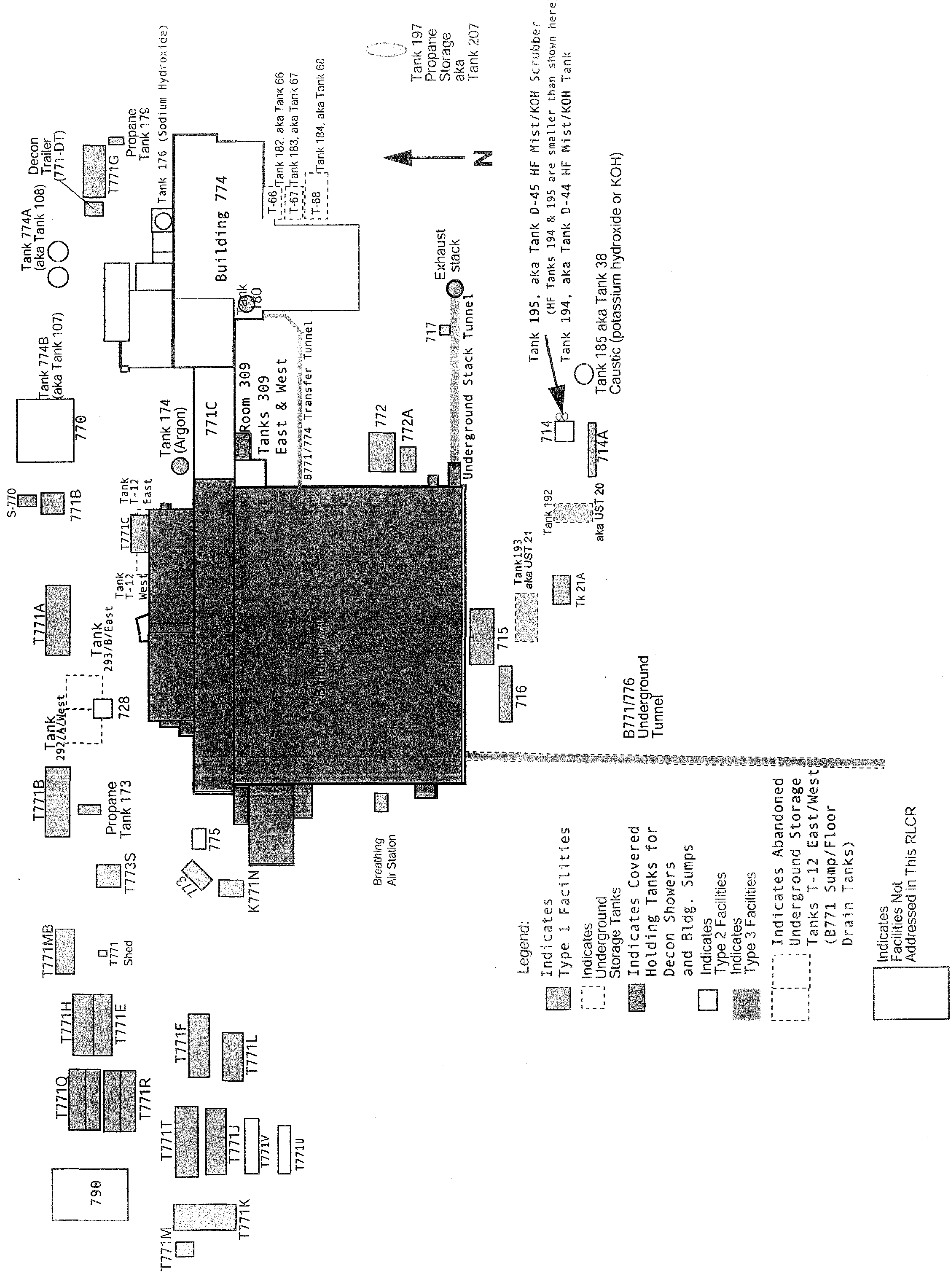
The purpose of this report is to communicate and document the results of the hazards characterization effort. The purpose includes summarizing the data into a concise, usable format and interpreting the data for use in management decisions, primarily:

- Definition of individual hazards and overall risk associated with facility decontamination and decommissioning (D&D); and
- Waste classification to enable compliant disposal.

1.2 Scope

This report covers the physical, radiological and chemical characterization of B771 and B774, including the 771/774 waste transfer tunnel and the 771/776 tunnel. Based on the hazards identified, the facilities were assessed against unrestricted release and waste disposal criteria. Environmental media beneath and surrounding the facilities are not within the scope of this characterization. However, Under Building Contamination (UBC) and Individual Hazardous Substance Sites (IHSSs) could have contaminated the below-grade portions of some facilities (e.g., foundations). Impacts will be defined during future investigation of the UBC and IHSSs, in-process characterization and the Pre-Demolition Survey, and/or characterization of demolition debris when building foundations are removed. UBCs and IHSSs associated with B771 and B774 are described in Attachment C of this report and in the 771 Closure Project Decommissioning Operations Plan, Modification 3, and Proposed Action Memorandum for Under Building Contamination Remediation, February 28, 2001. Both facilities and environmental media will be dispositioned pursuant to the Rocky Flats Cleanup Agreement (RFCA).

Exhibit 1-1 771 Closure Project Map Showing Type 1,Type 2, and Type 3 Facilities



2.0 OPERATING HISTORY AND PHYSICAL DESCRIPTION

2.1 B771

Building 771 is located in the north-central section of RFETS Industrial Area. The building is predominantly constructed of reinforced concrete, with some non-production portions of the building constructed of concrete block and fabricated metal. The original building was a two-story structure built into the side of a hill with most of the three sides covered by earth. The fourth side, facing the north, provides the main entrance to the building. The original building measures 263 feet (north to south) by 282 feet (east to west) on the ground floor, and 202 feet by 282 feet on the second floor. The building is 31 feet tall, and there are no outside windows in the main building. The north-side offices and cafeteria, and west-side Maintenance Shop areas have outside windows.

Since completion of the original building, six major additions have been constructed. This series of expansions brings the total area of the building to approximately 151,000 square feet.

- The first addition was B771A (this addition identification is no longer used), which was constructed in 1962. It is a one-story structure approximately 41 feet by 110 feet on the north side of the main building. This addition is separated from the process areas by a hallway and doors, and has a separate ventilation system.
- A second addition, B771B, was completed in 1966 (this addition identification is no longer used; B771B now is the Carpenter Shop north of B771). The addition is a one-story building, measuring 41 feet by 81 feet.
- Building 771 Dock 1 addition was added to the northwest side of the main building in 1968.
- The Maintenance Shop on the west side of the main building was constructed in 1970. The Maintenance Shop is 60 feet by 77 feet.
- The Drum Counting/Storage Facility, Building 771C, was built in 1972, and is a one-story addition to the east side of Building 771, extending to the west side of Building 774. Building 771C is an L-shape building approximately 40 feet by 120 feet with a 20 feet by 30 feet room, Room 309 or shed, constructed on the south side for covered holding tanks for Building 771 Sump Drains and Decon Showers.
- A plenum deluge catch tank shed, Room 190, built in 1974, was added on the west side of the original B771 adjacent to the Maintenance Shop addition. Room 190 is a one-story, 24 feet by 30 feet shed. Inside the shed is a 4000-gallon capacity deluge catch tank and support system to collect the water used while fighting a fire inside the filter plenums or incinerator.

B771, the primary facility for plutonium operations, was one of the four major buildings to be constructed and placed in operations at RFETS during the early 1950's. B771 operations included the chemical and physical operations for recovering plutonium and refining plutonium metal, plutonium chemistry and metallurgical research, and a radiochemistry analytical laboratory. The following provides a chronology of B771:

- 1951 In November, construction begins.
- 1952 B771 is occupied.
- 1953 In May, the first operations begin.
- 1957 On September 11, a glovebox fire occurs in the building, resulting in the transfer of a plutonium foundry, and fabrication and assembly operations to Building 776/777.
- 1958 A plutonium recovery incinerator begins operations.
- 1959 The solvent extraction process for plutonium recovery is replaced with an anion exchange process.
- 1963/64 771A is constructed to increase plutonium production. 771 processes were expanded into the Room 114 area to include an americium recovery line; dissolution lines; filtrate recovery; and batching, calcination and fluorination operations.
- 1966 An office expansion, 771B is added to B771
- 1970 An addition is completed on the west side of the building to consolidate all maintenance, pipe, sheet metal, and painting activities.
- 1971 B771C, a Drum Counting/Storage Facility, is completed.
- 1979 Plutonium recovery operations in B771 are discontinued. Cleanup operations begin in B771.
- 1980 B771 operations are restarted due to material accountability problems in B371.
- 1987 Construction began, but was never completed, on a roof addition for a Indirect and Direct Evaporative Cooler Area (IDEC Area). The addition was constructed on the north roof area of B771. The IDEC Area addition is approximately 52 feet by 282 feet by 20 feet high, and was designed to filter and pre-treat (heat or cool) inlet air for B771. The IDEC Area construction consists of a metal outer-wall covering sandwiched over insulation. The facility is steel I-beam construction with a metal roof over roof insulation. The IDEC Area contains eight large inlet air treatment units with associated control panel equipment. The area also has two floor pickup vacuum units, two cooling water pumps, and other miscellaneous related equipment. The west third of the IDEC Area appears to be a Construction Installation Shop for the IDEC equipment with tool Toters, construction Gang Boxes, ladders, gas bottle racks, welding curtains, etc.
- 1989 B771 plutonium operations are shut down in November as part of an overall plutonium operations shutdown ordered by DOE.

The B771 Stack is a reinforced concrete stack at the southeast corner of B771. The stack has an inside diameter of 10 feet, the base is 19 feet underground, and the stack rises 150 feet aboveground. The stack wall is 6 inches thick at the top and 11.5 inches thick at the base. The exhaust stack provides exhaust for the main filter plenum, which receives exhaust from the high-efficiency particulate air (HEPA) filtration system; the heating, ventilating, and air conditioning (HVAC) system; and the incinerator.

Buildings 771 and 774 are connected by a concrete utility tunnel and pipe chase tunnel, which runs southwest to west under the south embankment from B774, Room 202, to B771, Room 146. The tunnel interior dimensions are approximately 3.5 feet by 3.5 feet by 170 feet long with two 45 degree turns as the tunnel approaches Building774.

Buildings 771 and 776 are connected by a concrete tunnel, which leads from the southwest corner of B771, near Room 182A, to the northwest corner of B776. This tunnel is ventilated by the B776/777 ventilation system and has been controlled as part of the B771 Material Access Area. The concrete tunnel is approximately 8 feet wide by 10 feet high and 267 feet long with a six-percent incline up (south) to the B776 end of the tunnel. The tunnel roof and walls are 1 foot thick and the tunnel floor is 1.25 feet thick.

A 140-foot, steel-reinforced concrete exhaust duct tunnel connects B771 to the B771 exhaust stack. The tunnel is 8 feet wide by 10 feet high by 140 feet long. The steel reinforced concrete exhaust duct tunnel floor is steel reinforced concrete 1foot thick, and the walls and roof slab are steel reinforced concrete 10 inches thick.

2.1.1 Physical Description

2.1.1.1 General Construction and Foundation

B771 is "hardened" to ensure that it meets the design criteria for the containment of particulate radioactive material. The hardened construction includes all exterior walls, the main floor, the 2nd floor, and the roof. B771 rests on reinforced concrete footings with the south wall on steel-reinforced concrete footings mounted on fourteen 24" X 30" concrete pilaster pads. The footings and foundation contain steel-reinforced concrete wall and steel reinforced concrete column footings. All of the 24" to 18" concrete columns contain eight 1-1/2" steel reinforcement bars tied all the way from the concrete footings to the poured concrete roof. All of the concrete footing, wall, floor and roof intersections have steel strap tie plates. The southwest corner of B771 has a unique baffle-footing design under the massive concrete radiography vault shielding walls, Room 183. All of the concrete footings contain twelve 1-1/2" steel reinforcement bars that are tied to the building's concrete column structure supports. B771 is constructed on/in a hillside with the south, east and west outside walls partially below grade.

2.1.1.2 Walls

The exterior walls, both below and above grade, are cast-in-place steel-reinforced concrete tied to the footings, columns, floors and roof as described above. The interior walls, elevator walls, and stairway walls are constructed of poured-in-place concrete.

Some other interior walls are also steel-reinforced concrete, such as the vault rooms, and Rooms 141, 184, 187 and 188. Concrete block or cinderblock walls covered with wire-mesh and plaster separate the building hallways from process areas. Most walls are covered with paint, and lead-based paints may have been used. The wall paints used may also contain PCBs. Many of the concrete block or cinderblock walls act as fire containment barriers or fire stop walls. Other small lab rooms have Transite® or Gypsum® paneled walls. The old Chemical Line Control Room, Room 147, walls are a combination of concrete block and/or cinderblock walls with hollow Plexiglas®/Lucite® windows filled with water for neutron shielding. Various offices have Transite® or Gypsum® paneled walls, and in some office areas, wood paneling has been used.

2.1.1.3 Ceilings

The ceilings in process areas are usually the underside of the roof or the poured concrete floor above. Originally many process and laboratory rooms had false drop-metal ceiling tiles, but after contamination spills these metal-ceiling tiles were difficult to de-contaminate and were discarded. Presently none of the process area rooms have the metal ceiling tiles. Ceilings exposed to acid and caustic splashes or fumes are covered with a hi-gloss epoxy finish for easier decontamination. Some office and laboratory areas have suspended ceilings with pre-finished surfaces. The production area control rooms have suspended acoustical panel ceilings. Offices also have suspended acoustical panel ceilings. There are many office rooms back adjacent to process areas that still have suspended acoustical panel ceilings. The process area hallway ceilings are not covered and most of them contain electrical conduit, process piping, and miscellaneous building instrumentation.

2.1.1.4 Floors

The floors are poured-in-place steel-reinforced concrete. Most process room floors have epoxy paint finish for easier decontamination. All of the process room floors have been painted many times over the building's 48 year operating history. Most floors are covered with paint, and lead-based paints may have been used. The floor paints used may also contain PCBs. Many process rooms, such as Rooms 147, 154, 155, 155A, 156,156A, 162, 163, 164, 165, 166, 166A,167, 181A, 182, 182A, 183, 184, 186, 187, 188, 239, 240A, 240B, 240C, 240D, 240E, 241, 245, 283A, 283B, 283C, 283D, 283E, 283F and 283G, and most Corridors originally had floor tile. Some of these rooms no longer have floor tile. Carpet was put down over the tile in some areas such as offices.

2.1.1.5 Roof

A flat decking of steel-reinforced concrete forms the roof. The roof has an overlay of tar and gravel. The roof is divided into four sections, which run east to west.

- Roof 1, which is approximately 41 feet wide by 280 feet long, is the south section above the 2nd floor utility area. This roof section has 7 exhaust vents and 5 covered/capped openings.
- Roof 2 is the next roof north, which is approximately 162 feet wide by 280 feet long, and is also above the 2nd floor utility area and electrical motor control center rooms.

Roof 2, in approximately the middle section, has 5 cooling tower units. This roof section has many plumbing and heater vents, along with 5 covered/capped openings and a large y-shaped wooden roof walkway.

- Roof 3, is the next roof section north, which is approximately 60 feet wide by 280 feet long, and is above the 1st floor, covering the north half of Room 114, the women's and men's restroom, locker rooms, and shower rooms.
- The new IDEC Addition is also built above Roof 3. The roof of the IDEC Addition has two cooling tower units.
- Roof 4, which is approximately 41 feet wide by 206 feet long and includes the Transite roof section, is the most northern roof section, and it covers the cafeteria, the "cold" offices, Dock 1, and three north entrance doors (i.e., Doors 1, 2 and 3).

2.1.1.6 Doors

Exterior, compartment, and room doors are metal with metal frames. Doors in fire-barrier walls are rated and labeled in accordance with applicable National Fire Protection Association (NFPA) standards. The doors have fire ratings appropriate to the walls in which they are mounted. B771 has three main personnel door entrances (i.e., Doors 1, 2 and 3) and nine other entrance doors to the main floor, plus dock entry doors. B771 has two dock entry doors on the 2nd floor, one on the west wall near the southeast corner of the building, and one on the north wall leading into the 2nd floor IDEC Area.

There are no windows in the exterior walls of the hardened section of the building. Inside there are a few windows mostly in airlock doors, control room doors, and control room walls. For radiation shielding, the control room, Room 147, has Plexiglas® windows filled with 8 inches of water between two layers of glass or Plexiglas® to provide neutron shielding for operating personnel. The north office area, the "cold" maintenance area offices, and the cafeteria have windows in the outside walls.

2.1.1.7 Physical Interfaces

There are several different types of process area and building physical interface devices:

- The west hallway stairway, Stairway 1, allows access to the 2nd floor, utilities, and Utility Control Room.
- The east hallway stairway, Stairway 2, allows access to the 2nd floor Chemical Makeup Room, utilities and Utility Control Room.
- the east hallway elevator allows for the movement of drums, chemicals, HEPA filters, and equipment to the 2nd floor.
- The emergency egress stairway, Stairway 3, allows for emergency egress from the southeast corner of the main floor.
- The 2nd floor has a steel stairway and penthouse leading up to Door.
- The Control Room, and Rooms 283A, 283B, 283I and 283J have a stairway, Stairway 4, leading out of the 2nd floor to the roof and emergency generators B715 and B716.
- The 2nd floor dock, Upper West Dock , leads to Dock Door 23.
- There is a metal exterior stairway leading up to the IDEC Area.

- B771 has three main floor north/south corridors (Corridors A, M and G), which are for the most part back behind the airlock doors leading to RBA and CA rooms and process areas.
- B771 has an underground tunnel leading up to B776. The tunnel allowed material and equipment movement between the two buildings.
- B771 has a liquids pipe transfer tunnel to B774, allowing waste solution shipments (via pipeline) from B771 to B774 for waste processing.
- B771 has an underground stack tunnel that allows the building exhaust from the Main HEPA Filter Plenum to flow to the Exhaust Stack.
- B771 has two main east/west corridors (Corridors D and E), which are located back behind the airlock doors leading to RBA and CA rooms and process areas.
- The "cold" side has three more corridors (Corridors B, C and F), which lead to offices, locker rooms, and office and cafeteria areas, respectively.
- The "cold" side of Corridor A leads to Corridors C, B and F, Door 2, and Dock 3.
- The "cold" side of Corridors G and M lead to Doors 5, 129D and 12D, and Dock 1.
- Corridor B leads west from Corridor A to Door 1.

2.1.1.8 Utilities

B771 utilities are listed below.

- Electrical - connected to Substation 517-2 and Substation 518-3 (see Sections 2.1.9 – 2.1.12)
- Nitrogen - connected to the Plant Nitrogen Facility
- Argon – connected to Tank 174
- Plant Air – received from Building 776
- Breathing Air – received from B776 (B772 to come on line soon)
- Criticality Accident Alarm System (CAAS) – connected to the Plant System
- Life Safety/Disaster Warning (LS/DW) System – connected to the Plant System
- Water – received from B124
- Steam – received from B443
- Sanitary Sewer – connected to the Plant System
- Liquid Process Waste – connected to the Plant System
- Natural Gas – connected to the Plant System
- Telephone system – connected to the Plant System
- Fire Protection Systems – connected to the Plant System
- Security Protection Systems – connected to the Plant System
- The Grounding/Lightning Arresting System interconnects B771, B715 and B774.

2.1.1.9 Electrical Systems

B771 currently receives power from two separate substations (i.e., 517 and 518). The feeder lines that are connected to the B771 transformers are designated as 517-2 and 518-3. The substations reduce power to 13.8 kV, and the transformers reduce the power to

480 V ac, which is distributed throughout the building by electrical distribution equipment. The diesel generator busses, designated with the prefix "E" (emergency), are part of the electrical power system but can also receive backup power from the diesel generator system.

The Electrical Power System SWGR 771-2 and SWGR 771-3 circuit breakers feed power to the Emergency Distribution (EMD) equipment and their loads. The electrical power system in includes:

- Power Distribution Panel PD 2m-14, which provides 480 volt electrical power distribution to B771 non-essential loads;
- Diesel generator components, which include two diesel generators (EG-1 and EG-2) connected to two automatic transfer switches (ATS-1 and ATS-2);
- Switchgear 771-1;
- Switchgear 771-2;
- Switchgear 771-3;
- Switchgear EMSWGR 2-13A; and
- Switchgear EMSWGR 2-13B.

2.1.1.10 Utility Control Room

All of the HVAC and utilities systems (with a few minor exceptions) are controllable from the Utilities Control Room, Room 283A, which is located on the 2nd floor on the south wall. All of B771, B771C, and B774 utilities systems are monitored and have problem alarms in the Utilities Control Room, Room 283A.

2.1.1.11 Uninterruptable Power System (UPS) System

The UPS is located in the southwest corner of the 2nd floor in Room 283, directly west of Offices/Rooms 283D, 283E and 283F. The UPS is a dedicated system for B771.

2.1.1.12 Emergency Lighting

Emergency lighting is provided throughout building to allow emergency egress. The system includes emergency lights and power to emergency exit signs. Emergency lighting is provided with internal battery power within designated lighting fixtures. The existing Emergency Lighting System is composed of a combination of fluorescent and incandescent emergency light sources, emergency exit signs (light-emitting diodes), and emergency power junction boxes. The Emergency Lighting System has been upgraded to meet the minimum functional requirements of the National Fire Protection Association (NFPA). The upgrades provided battery-powered incandescent lamps, seismically mounted as required to provide necessary illumination for egress.

2.1.1.13 *Fire Suppression Systems*

The Fire Suppression Systems consists of fire water supply, risers, distribution piping and automatic sprinklers, a CO_2 fire extinguishers, the Filter Plenum Deluge System, a Fire Detection and Alarm System. Each system is g installed in accordance with NFPA requirements. Fire water is supplied to the facility from the site Domestic Water Supply (DWS) System. The DWS System is a 10-in. pipe that loops around the B771. Water can be supplied in either of two directions using sectional control valves, ensuring capability for continuous service in the event of a line break. Portable fire extinguishers are currently located throughout the buildings. The Fire Protection Systems in B771 include:

- Fire Water Supply;
- Automatic Sprinkler System;
- Hose Connection Stations;
- Filter Plenum Deluge System;
- Fire-phones;
- Glovebox (GB) Overheat and Storage Tray Overheat; and
- Final Confinement Barriers.

These Fire Protection Systems work in conjunction with or support the Fire Department for extinguishing fires.

2.1.1.14 *Heating, Ventilation and Air Conditioning (HVAC)*

There are 12 supply systems within B771 that provide heating, ventilation and air conditioning (HVAC). Each HVAC supply system has its own supply fans and, except for Systems 10, 11 and 12, they are all single-pass systems (i.e., 100% of the make-up air comes from outside). The configuration of the once-through supply air systems, with the exception of Systems 7, 8 and S-13, includes inlet backdraft dampers, rollamat filters, deep bed filters, air washers (cooling), preheat coils (heating), inlet vane volume controllers, supply fans, and discharge dampers on the supply fans. Systems 7, 8 and 13 include filters and heating coils. Systems 8 and 13 fans also contain inlet backdraft dampers, while System 7 utilizes a discharge damper on the fan. The air ducts are equipped with spring-loaded fire dampers where the ducts penetrate the second floor. The fire dampers have a fusible link that melts at predetermined temperatures and releases the dampers. There is no other installed fire protection equipment in the supply air systems.

Supply Fans S-1, S-3, S-4, S-5, S-6, S-8 and S-9 are the main supply fans for the building. All are interlocked with the main exhaust airflow and will be shut off whenever the indicated main exhaust airflow drops below approximately 115,000 (nominal) cubic feet per minute (cfm). The backdraft and supply fan inlet dampers fail closed (i.e., close

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automatically). Supply fans S-10 and S-11 supply fresh air to building 771 Offices and Cafeteria. Supply fan S-12 supplies fresh air to the Building 771 Maintenance shop.

Supply Fan S-1 is part of a unique supply and exhaust air system. To keep the area supplied by the S-1 (men's and women's locker rooms) positive to the operational areas, the S- I must be in operation before FN-6, the exhaust air fan for the area served by S-1, can be put in service. Fans S-1 and FN-6 are interlocked so that whenever S-1 stops FN-6 will also stop. Exhaust air from FN-6 goes through the FU-4 filter plenum's single stage of furnace filters and single stage of HEPA filters before entering the Main Exhaust Filter Plenum. The FU-4 HEPA filters are installed so that airflow in the reverse direction seats the filters. This protects the locker room from contamination from the Main Exhaust Filter Plenum if an airflow imbalance/reversal condition should occur.

Supply Fan S-9 also has an interlock with Exhaust Fans E-7 and E-8 such that Fan S-9 shuts down in the event that both fans are not operating to avoid the potential pressurization of Room 114 and other rooms supplied by Fan S-9.

The Utilities Control Room (Rooms 283A) has its own supply air system. Air is brought into the S-13 supply fan through a HEPA filter to remove potential radioactive contamination, passes through preheat or cooling coils, and then into the Control Room. The air from the Control Room is exhausted into the Main Plenum between the first and second stages of HEPA filters. Negative pressure is maintained in the operational areas while the Room 283A is maintained positive relative to the adjacent Room 283 (Zone 111) to ensure the Utilities Control Room is positive to surrounding areas. An air conditioner maintains room temperature low enough to prevent overheating of the electronic controllers and other instrumentation.

The Annex is an addition to Building 771 with its own ventilation system. The Annex consists of two distinct areas: the west area (Rooms 301 and 304) and the east area (Rooms 303, 305, and 306), which also includes the dock and receiving area.

System HV-1, located in Room 303, supplies fresh air to the Annex. The HVAC System is a single-pass system. Air enters the facility near the middle of the south wall of the area through a bird screen. The air is then brought into HV- I through a preheat coil and a furnace filter or, in summer, an impingement filter. It then passes through an air washer (cooling), reheat coil (heating), and supply fan ISA-2, and is supplied to both ends of the Annex. A damper fails closed to isolate Rooms 301 and 304 upon loss of power or air to prevent backflow out of the rooms.

There are two distinct exhaust systems for the B771 Annex, one for the east area and one for the west area. Air from the east end of the Annex (Rooms 303, 305 and 306) is exhausted via two separate ducts, one on the northeast and one on the southeast side of the room. The air passes through one HEPA stage (for F-5) (one furnace filter stage and one HEPA filter stage for F-6), and a fan (located on the roof) before being released to

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the environment. This system maintains a negative differential pressure (DP) in the east side of the Annex. If the negative DP drops below 0.05 in. wg, an alarm will sound in Rooms 302 and the Control Room. Supply Fan ISA-2 will shut down, and the supply air dampers to Rooms 301 and 304 will close.

Air from the west end of the Annex (Rooms 301 and 304) is pulled into the Annex Exhaust Plenum 771C. Air passes through impingement filters and two stages of HEPA filters before exhausting to the atmosphere. Two exhaust fans are located on the roof, with one fan running and the other in standby. The second fan automatically starts if the first fan fails. If the room DP in the west end of the facility drops below 0.25 in. wg nominal negative with respect to atmosphere, an alarm will sound in Room 301 and the Control Room. Supply Fan ISA-2 will shut down, and the supply air dampers to Rooms 301 and 304 will close.

Upon the startup of the exhaust fan(s), the backdraft damper and isolation dampers will open, allowing the fan(s) to run. Each exhaust fan has a backdraft damper and isolation damper.

The DP for Annex Rooms 301 and 304 is maintained less negative than the B771 operational area in order to direct exhaust flow toward the Main Exhaust Plenum in the event of an upset condition.

Normal building operations of the B771 Annex exhaust system is an ongoing evolution requiring constant control. Airflows are checked on a routine schedule and any disruptions are corrected immediately, either by adjustments in the instrumentation Control Room or by controlling airflow with local hand dampers.

The B771 ventilation systems provide five zones of different relative pressures as appropriate to provide assurance that contamination will not migrate to less contaminated areas. The zones are as follows:

- Zone I provides the ventilation for the primary confinement where highly radioactive material is handled. Zone I (and Zone IA) is maintained at the lowest pressure, or greatest Differential Pressure (DP), for gloveboxes, and conveyer enclosures. Zone I exhaust ventilation is filtered and discharged from the facility.
- Zone IA provides the ventilation for the primary confinement in vaults and the Contamination Control Cell, which are in direct contact with radioactive or hazardous materials. Zone IA exhaust ventilation is filtered and discharged from the facility.
- Zone II provides the ventilation supply and exhaust for the secondary confinement in the building by establishing an intermediate differential pressure and ensuring filtration of air, which is normally recirculated within the facility. Zone II includes any areas containing Zone I or Zone IA equipment, or otherwise communicating with these areas (e.g., adjacent area outside boundary).

The filtration for B771 exhaust is provided by exhaust fans and HEPA filters, thereby limiting the unfiltered leakage from the building, protecting the public, the building

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workers, and the Plant Site population. Zone I, Zone1A, and Zone II exhaust through operable filtration plenums.

2.1.2 Historical Processes

B771, which began operations in 1953, housed five major groups: Plutonium Recovery, Plutonium Special Recovery, Plutonium Chemistry Research and Development, Plutonium Metallurgy Research, and the Analytical Laboratories. Plutonium Recovery processed a variety of plutonium-bearing residues to recover as much plutonium as was economically feasible. Special Recovery Operations processed scrap metal and oxide residues containing elements and isotopes that could have otherwise contaminated or diluted the War Reserve stream. Plutonium Chemistry Research and Development groups supported and developed methods for recovering, separating and purifying actinides. The Plutonium Metallurgy Research group assisted the design agencies and plant production in developing weapons machining and fabrication processes. The Analytical Laboratories received, prepared and analyzed liquid and solid samples for plutonium, americium, uranium, neptunium, and other radioactive isotopes. The laboratory was also used to analyze solutions for normality and for impurities present in the process streams.

2.1.2.1 Room 149 Pu Process Area

Room 149 had many different processes over the last 35-40 years, including skull oxide dissolution, solvent extraction, ion exchange, incineration, trough dissolution, glove washing, peroxide precipitation, calcination, conversion of green cake to PuF_4 HF, hydrofluorination, reductions and button break-out, Am processing, feed evaporation, HCL dissolution and cation exchange, cascading oxide dissolution, cascading SS&C dissolution, lab waste precipitation, lab waste recovery by cation exchange, acid fume scrubbing, incineration off-gas scrubbing, crushing and grinding of SS&C, crushing and grinding of ash, Nash Pump vacuum operations, Bingham Pump vacuum operations, and many other plutonium recovery processes. Many radioactive and/or hazardous substances are known to have been used, processed or stored in the gloveboxes, tanks, piping and equipment, as shown in Table 1, Sets 21-34, of the Building 771 RLCR, Revision 2, August 8, 1998.

2.1.2.2 Rooms 146, 147 and 148 Pu Process Area

Rooms 146 and 148 originally had duplicate, remotely operated Chemical Conveyor Lines (Chem Lines), and Room 147 was the control room. Each of the Chem Lines had Pu nitrate peroxide precipitation, green-cake calcination, green-cake hydrofluorination, metal reduction, and button break-out processes. The continuous Chem Line gloveboxes were connected on the south end (Room 181) by another continuous glovebox/conveyor line. Room 146 (north) later became the Plutonium Special Recovery area, with new gloveboxes, tanks and equipment installed. This new equipment allowed for special residue dissolution, ion exchange, precipitation, solvent extraction, and other related special recovery processes. See Table 1, Sets 34-36, of the Building 771 RLCR, Revision

2, August 8, 1998. Several hundred grams of SNM hold-up is present in the gloveboxes and transfer piping.

Room 146A was striped of all the old glovebox and Chem Line equipment, and an R&D rotary tube hydrofluorinator was installed and operated for a couple of years. This hydrofluorinator was later relocated to Room 148 and turned over to Pu Recovery Production. This same hydrofluorinator was subsequently relocated to Room 114. Room 146A then had the R& D Production Proto-Type Fluoride Volatility Process (FVP) installed. The FVP used fluorine gas and elevated temperatures to convert impure foundry oxide (impure $Pu0_2$ to pure PuF_6 and pure PuF_4 to Pu metal buttons. The FVP was operated on a limited R&D basis for several years. The FVP was then converted to a Fluid Bed Fluorination (FBF) process to simulate the four FBF systems in the B371 Fluorination Canyons. The Building FBF system was operated for a year to develop operating parameters for the Building 371 FBF systems. See Table 1, Set 36, of the Building 771 RLCR, Revision 2, August 8, 1998. Multiple kilograms SNM hold-up is present in gloveboxes SR11 and SR12 and associated equipment and piping.

Room 146C, which is the old Corridor G, is a form vault area used to store low level residues. The vault is surrounded by both Benelex and lead shielding. Minor residue radionuclide contamination is expected.

2.1.2.3 Room 181A Process Area

Room 181A had many different types of processes and gloveboxes over the years. Originally there was waste sorting and packaging, which sorted out line-generated wastes and bagged them out in the various waste categories. A glovebox was setup to separate the wood frames from the HEPA filters for incineration and/or further processing. At one time, Room 181 had a tantalum leaching process, which removed Pu from casting funnels and crucibles. Ash and sludge leaching and calcining was another process. Another process was an R&D Direct Oxide Reduction process that operated several years using calcium metal and chloride salts to convert calcined green cake to Pu metal. A glovebox system and process tanks were installed for solvent extraction for uranium bearing acidic solutions. Room 181 presently houses only size-reduction tents and the associated plasma-arc cutting and off-gas scrubbing/filtration system for the on going D&D and size reduction operations of Building 771. See Table 1, Set 37, of the Building 771 RLCR, Revision 2, August 8, 1998.

2.1.2.4 Rooms 182,183, 184, 185, 186 and 188 Process Area

Originally Room 182 had part-casting furnaces, machining, and fabrication operations for the weapons program. Later Room 182 became a Plutonium Metallurgy Research laboratory. Rooms 183, 185 and 186 were metallurgy. Rooms184 and 188 became storage vaults, but have since been striped and are used for miscellaneous storage. Rooms 183 and 186 are presently size-reduction areas with size-reduction tents and related equipment. See Table 1, Sets 38- 40, of the Building 771 RLCR, Revision 2, August 8, 1998.

2.1.2.5 Room 114 Plutonium Recovery and Processing Area

After the 1963/64 Plutonium Recovery expansion in Building 771, Room 114 became the Fast Side Recovery, with new gloveboxes for Am recovery and processing, and Line 1 and Line 2 for Pu metal dissolution and other miscellaneous processing. A new Line 3 was installed for dissolution of plutonium oxides. Many other new gloveboxes were installed during the expansion for ion exchange, Nash vacuum operations, rotary tube calcination, rotary tube hydrofluorination, batching, precipitation, feed evaporation, spray dissolution, and Pu tetrafluoride reduction to Pu metal. Rooms 114B and 112 were the new Reduction and Button Break Out and Control Room areas. See Table 1, Sets 6-18, of the Building 771 RLCR, Revision 2, August 8, 1998. Several hundred grams of SNM hold-up is present in the gloveboxes and transfer piping.

2.1.2.6 Room 141 Process Area

Room 141 originally was constructed as a SNM Vault and was later converted to a "House Vacuum" pump room. Operational problems with the pumping operations in Room 141 resulted in spills of radionuclide bearing acidic solution that contaminated the concrete floor and pedestals. Operation of Room 141 was eventually phased out. Subsequent remediation actions to remove the contaminated concrete resulted in high airborne concentrations of Pu, and the room was eventually sealed. Lead shielding existed during the pump operation period, and it is expected that acid spills may have deposited lead contamination in the concrete structures of the room. It is estimated that several grams of SNM hold-up are present in the concrete and room structures.

2.1.2.7 Corridor B "Cold Office Area"

The Corridor B "Cold Office Area" includes all of Corridor B and Offices 116, 117, 117A, 118, 119, 119A, 119B, 119C, 119D, 124, 125, 125A, 125B, 125C, 125D, 125E, 126, 126A and 126B. Room 116 contains the connection point to the plant fiber optics system.

2.1.2.8 Corridor F "Cold Office and Cafeteria Area"

The Corridor F "Cold Office and Cafeteria Area" includes Rooms 103, 104, 105, 105A, 105B, 107, 109, 110, 110A and 110B; Corridor F; a Criticality Alarm Panel; and partition walls.

2.1.2.9 Locker Room Areas

This area includes the men's and women's locker rooms, the janitor's closet, and the laundry cage in the men's locker room. Equipment consists of lockers, benches, and plumbing fixtures.

2.1.2.10 *Room 129 "Cold Maintenance Area"*

The Room 129 "Cold Maintenance Area" includes Rooms 129, 129A, 129B, 129C, 129D, 129F, 130, 131, 132 and 132A; Dock 2; partition walls; and the area roof. Lead shielding was machined and formed in the Maintenance Area Rooms. Electrical equipment and CFCs, such as freon, were stored in the area.

2.1.2.11 *Room 164 Analytical Laboratory Area*

The Room 164 Laboratory Area includes Rooms 154,155, 155A, 156, 156A, 161, 162, 163 and 164. Most laboratory operations took place in gloveboxes and hoods. Lab analysis included radio-assay for liquids, and X-ray defraction for liquids and solids. The Standards Labs prepared non-destructive assay standards for plutonium, americium, uranium oxides, and metals (including beryllium) for a wide range of instrumentation. See Table 1, Set 46, of the Building 771 RLCR, Revision 2, August 8, 1998.

2.1.2.12 *Room 151 Radiation Control Area*

The Room 151 Radiation Control Area includes of Rooms 135A, 135B, 151, 151A, 151B, 151C, 151E, 151F and 152. This includes the RCT areas, the selective alpha air monitor (SAAM) alarm panel, the Radcon Support Lab, doffing area, and decontamination showers. Room 152 has many lead bricks.

2.1.2.13 *Room 153 Process Area*

Room 153 was an R&D area that included Gloveboxes 153A, 153B, 153C, 153D and 153E; "Hot Cells" (HC) HC1, HC2, HC3, HC4, HC5 and HC6; and Tanks T-3, T-4, T-86, T-87 and T-88. The area also includes test equipment, piping, remote manipulators, and water-walls. Gamma and high neutron emitting materials were processed, handled and packaged in this area. Various type of shielding, including Benelex, lead, and Plexiglas, are present. Mercury-filled instruments are present. Various other chemicals were used, including acids, bases, oils, and solvents. See Table 1, Set 48, of the Building 771 RLCR, Revision 2, August 8, 1998.

2.1.2.14 *Room 157 Stockroom Area*

Room 157 was an R&D support area until it was converted to a stock room/storage area in 1992. Residual contamination from past operations may exist in inaccessible areas.

2.1.2.15 *Room 158 Lab Area*

The Room 158 Lab Area includes Rooms 158, 159, 160, 165, 166A, 166B, 168 and 169. The area contains gloveboxes and B-Boxes used for laboratory analysis of Pu, Am and U, including Gloveboxes 158 North, 158 South, BX1, BX2, BX3, BX4, BX5, BX8 and BX9; and Hoods 2, 663A, 663B, 663C and 664. The area also contains the calorimeters and the Standards Laboratory where standards for counting equipment were prepared. Rooms 158 and 159 were the radiochemistry labs. Room 160 was the Calorimeter Lab, which contained cooling systems. Room 165 is the smear counting room that also has cooling systems. Room 166A was the Electronics Maintenance Shop. Solvents have been used and stored in this room. Lead solder was also commonly used in the instrument shop. Room 166B was used as a R&D metal-casting laboratory. Room 168 is a janitors closet and storage area. Room 169 is the standards fabrication and calorimeter analysis lab. The calorimeter includes a cooling system. Many lead bricks are also stored here.

2.1.2.16 Room 149 Utilities Support Area

The Room 149 Utilities Support Area includes Room 149A, 149B, 149C, 149D and 149E; plumbing fixtures; condensate tanks; pumps; and piping. Room 149A contains the steam condensate collection tanks for the utilities condensate system. Water is collected and then pumped to the B771 South Roof area. Room 149B and 149C are currently used as storage rooms. Room 149D is a new condensate collection system, which was never put into service. Rooms 149A and 149D have pumps that contain lubrication oils. Room 149E is a maintenance storage closet. A sump is also located in Room 149E.

2.1.2.17 Room 180 Office Area

The Room 180 Office Area includes Room 180G, 180H, 180I, 180J and 180L. These are offices an a corridor (L). This area contains cabinets and office furniture. Various RCRA-listed chemicals were formerly stored in these rooms.

2.1.2.18 Rooms 180A-F, 180K, 187 and 188 Process Area

This process area includes Rooms 180A, 180B, 180C, 180D, 180E, 180F, 180K, 187 and 188. This process area has always been a Process Chemistry R&D area, with many process gloveboxes, process tanks, and associated process piping. Room 180A is a process simulation lab used for R&D work to define process operating parameters. Lead shielding is used through the glovebox systems, as well as water-wall shielding. Room 180B is a vault that has been cleaned out and RCRA closed. Room 180C is an extension of 180A. Room 180D included a glovebox used for hydroxide precipitation and neutralization of lab wastes. Room 180E contains furnace casting metal storage within gloveboxes for R&D operations. Multiple kilograms of SNM hold-up is present in the 180E gloveboxes and process lines. Room 180F is a R&D analytical lab for radionuclide bearing acid and basic solutions. Room 180K is an R&D processing and storage facility for aqueous radioactive solutions. Lead plate, lead-lined glovebox gloves, and leaded glass windows exist in each of the 180 Process Area Rooms. The 180 Process Area is the origin of the 1957 fire, resulting is wide spread radioactive contamination. Many areas were painted to fix contamination, which is still present. . See Table 1, Set 43, of the Building 771 RLCR, Revision 2, August 8, 1998.

2.1.2.19 Room 179 Maintenance Area

The Room 179 Maintenance Area includes Rooms 178, 179 and 179A, and Glovebox 179A. This area contains lathes, mills, saws, and other maintenance equipment. Lubricating oils, cutting oils, and solvents were used and stored here. Additionally Freon was commonly used as a degreasing cleaner. The glovebox in Room 179A was primarily used for maintenance of radioactively contaminated equipment.

2.1.2.20 Room 174 Process Area

The Room 174 Process Area includes Rooms 172, 174, 175 and 176. Gloveboxes A1 and A4 contained nitric acid spray leaching processes to strip Pu contamination off of U components and parts. SNM hold-up for these boxes is expected to be several grams. Lead in the form of plate shielding, leaded glass windows and lead-lined gloves are on the gloveboxes. There are also six storage cabinets and a refrigeration unit. Gloveboxes A2 and A3 are evaporators for concentrating the spray leach solutions from A1 and A4. Mercury is expected to be contained in analytical instruments. A caustic scrubber is connected to the gloveboxes, which was used to neutralize the acidic fumes. Glovebox A-1097 contains a HR Nash vacuum pump that provided the primary negative pressure to transfer solutions to the storage tanks. A heat exchanger cooled the pump. See Table 1, Set 45, of the Building 771 RLCR, Revision 2, August 8, 1998.

2.1.2.21 Room 190 Deluge Process Area

The Room 190 Deluge Process Area includes Room 190, Tank V-2, piping exterior walls, and roof. Tank V-2 collects fire suppression water from the zone plenums. These liquids are known to be contaminated with particulate from glovebox exhaust. Pu and U are the radioactive contaminants for the V-2 Tank, piping, and room if leaks and spills occurred.

2.1.2.22 Main Plenum Area

The Main Plenum Area includes Room 280, 280A, 280B, 281, 281A, 281B, 282, 282A, 282B, 282C and 282D; filter elements; cinderblock walls; and plenum doors. The primary filter bank contains 525 filters. The secondary filter bank contains 391 filters. All airborne radioactive particulate from the B771 processes and process rooms may be deposited into the filter media.

2.1.2.23 Room 309 Tank Area

The Room 309 Tank Area includes Room 309, Tank 309 East (aka Tank D309E), Tank 309 West (aka Tank D309W), two outside walls, an entry door, piping , and valves. The tanks collect liquids from building sumps, sinks, and decontamination showers for sampling prior to release to waste processing. See Table 1, Set 53 and Set 57, of the Building 771 RLCR, Revision 2, August 8, 1998.

2.1.2.24 Room 283 HVAC Exhaust and Utilities Area

This area includes Room 283, 283A, 283B, 283C, 283D, 283E, 283F, 283G, 283H, 283I and 283J; the six main exhaust fans and motors; office walls; uninteruptable power supply system; main electrical switch gear; and Control Room Panels.

2.1.2.25 Room 235 HVAC Supply and Utilities Area

This area includes Rooms 232, 233, 234, 236, 237, 238, 238A, 239, 240, 240A, 240B, 240C, 240D, 240E and 240G; supply fans and motors; plenums; and walls. This area contains the B771 air intake system, consisting of filters, heaters, blowers and dampeners.

2.1.2.26 Room 249 HVAC Exhaust and Utilities Area and Chemical Makeup

This area includes Rooms 229, 230, 231, 241, 245, 246, 246A, 247, 248 and 249; Zone 1 Filter Plenums, fans, motors, and ductwork; and chemical make-up tanks, piping, and valves. Room 247 includes chemical reagent supply tanks for B771 operations. Room 246A contains a hydrofluoric acid evaporator with associated piping and valves. Room 246 was the dry chemical storage room for Building 771. Many different types of dry chemical were stored in this room over the years, including calcium metal that was used for Pu metal reductions in Building 771. The Zone 1 Filter Plenums are highly contaminated and have the potential to contain anything that was exhausted from the Building 771 gloveboxes and hoods. Multiple kilograms of SNM hold-up is present in the Zone 1 Filter Plenums.

2.1.2.27 Corridors A, D, E, G and H; Stairwells 1, 2 and 3; Utility Room 127 and Tunnel Area

This area includes Corridors A, D, E, G and H; Stairwells 1, 2 and 3; Room 127; Tunnel (only to the south outer wall of Building 771); security electronics equipment; lockers; doors; and piping. Residual contamination from the 1969 fire and the B776 water main break is expected. Radionuclide bearing acidic and basic chemicals have been transferred in pipelines above the drop ceilings.

2.1.2.28 Indirect/Direct Evaporative Cooling (IDEC) Area

The IDEC Area includes 8 new intake air systems, piping, valves, electrical distribution and control panels, and the metal building located on the North Roof area of B771. All of the equipment in the IDEC Area is new ventilation equipment that has never been put into service.

2.1.2.29 Building 771 HVAC Zone 1 and Zone 2 Ducts in Room 249

The Building 771 HVAC Zone 1 and Zone 2 Ducts are located mostly in Room 249, with the ducts leading up from the various process area rooms on first floor (aka known as the Basement Floor). The Zone 1 Ducts contain radioactive contamination and SNM hold-up of multiple kilograms of material. The Zone 2 Ducts are known to contain residual contamination as a result of spills and internal releases.

2.1.2.30 Tank T-12 East and Tank T-12 West

T-12 East and T-12 West are 20,000 gallon, abandoned underground concrete tanks, and part of IHSS 000-121 Tank 12-OPWL. They are located below the Bu771 Cafeteria and Shower/Locker Trailer T-771C. Process knowledge information indicates that at one time the two tanks received liquids from the B771 process area floor drains and liquids from the B771 foundation/footing sump pump drains. All process area floor drains were sealed after the B776 fire because contaminated water ran down the B771/776 Tunnel and flooded many rooms in B771 and the contaminated water drained out through many of the floor drains.

2.1.3 Current Status

The Building 771 Closure Project is currently removing gloveboxes, tanks, equipment and piping throughout the building. Room configurations change almost daily. B771 had approximately 240 gloveboxes. As of March 14, 2001, the Project had removed 118 gloveboxes, 69 process tanks, and related process piping and equipment.

2.2 B774

B774 was built to the east of B771 in 1953 as the original radioactive liquid and hazardous waste treatment facility on plant site. The building originally processed liquid wastes from Buildings 122, 123, 441, 442, 444, 881 and 771, which were sent to the building by underground waste transfer lines. The waste transfer lines from Building 771 were enclosed in an underground concrete tunnel. Later, B774 received liquid wastes from Buildings 559, 707, 776, 777, 778, 779, 865 and 883 via transfer lines as these buildings came on line. Liquid wastes from other buildings were transferred via 55 gallon drums or plastic bottles.

The original building was constructed of reinforced concrete. Several additions were added onto the building as waste volumes increased and new processes were added as treatment options. The construction materials used in the construction of these additions consisted of Transite®, reinforced concrete, corrugated metal, ridged insulation panels covered with aluminum sheet, steel-metal framing, cement block, pre-stressed reinforced concrete twin-tee panels, metal panels or combinations of these materials. There are under ground concrete tanks and above ground steel tanks in the building to store liquid wastes.

2.2.1 Physical Description

2.2.1.1 General Construction and Foundation

Originally B774 was a two-story, 60 by 60-foot, reinforced concrete structure. The first floor was partially below grade with its foundation walls set on spread footings. The foundation walls become the exterior walls of the building and extend to the roofline, with the second-floor level being at the finished grade on the east side of the building. There was one dock door, one man door, and two equipment hatch covers to the first floor on the north side of the building. On the east side of the building there was a double door to a small covered dock at grade level.

The building is divided in half, with the west half used to treat high-level alpha activity wastes and the east half used to treat low level wastes. The dividing wall is made of reinforced concrete that ties into reinforced concrete beams that support the floor and ceiling. Entrance to the building is up concrete steps to a landing to room 207, which was a locker room. The east wall of this room was the west wall of Room 204, which is the control room for all equipment operations and the building office. This wall has been removed. The south wall of Room 204 is gypsum board on metal studs. The door in the southeast corner of the room opens into an airlock that was built in the northeast corner of Room 203. This airlock is constructed of gypsum board and metal studs. Rooms 205 and 206 were a restroom and shower respectively in the original construction. Presently Room 205 is used as a storage room for clean clothes.

At the southeast corner, outside of the original building, were eight concrete waste tanks. The base of the tanks was at the second floor level. All of the tanks had a valve vault that was accessed from the second floor. The tanks had manhole covers that could give access to the top of the tanks. These tanks were covered with two steel-framed corrugated metal sided and roofed sheds. The tanks ranged in capacity of 3,000 gallons to 12,000 gallons. Two 3,000 and four 6,000 gallon tanks were built into the structure of the building (since removed). Two 12,000 gallon tanks are located east of the tanks built into the building, and have been emptied and foamed.

A 7,000 gallon concrete tank, T 40, was built into the floor of Room 203 to hold the sludge from the second stage clarifier and had a grated access for decanting operations. Currently the opening is sealed, and the tank is not operational. It is being replaced with a horizontal steel tank in Room103.

In 1958 a 30,000 gallon concrete tank was constructed south of the two 12,000 gallon tanks. This tank is still present, and has been emptied and foamed.

All additions to Building 774 have a floor level starting at the same level as the second floor of the original building and are numbered as such. Room 206 as it now exists was created in the late 50's or early 60's when the first addition, a 15 by 24 foot addition, was built to the west of the entrance stairs and east of the west equipment hatch. A doorway was cut in the outside wall of the building. This addition contained three rooms, 206, 207 and 208. These rooms became the men's locker, shower and restrooms for the building.

The second addition, Room 210, to the building was built in 1962 to the west of the original building. It is a 30 by 40 foot steel-frame structure that has its north side even with the north side of the original building. Covering the steel framework on three sides are vertical metal panels. The east wall of the addition is the west outside wall of the original structure. These metal panels form the inside and outside walls of the addition. The roof is a metal pan with concrete poured on top of it and topped with ridged insulation, membrane, tar and gravel. Access to this addition is gained through an 8 by 8 foot opening cut in the northwest corner of the original structure (Room 202). In the southeast corner a filter plenum, which is no longer in use, was built with a 30-foot exhaust stack extending through the roof and held in place with three guy wires.

When the 771C addition was built onto Building 771, an opening was cut in the northeast corner of Room 210 for a stairway to the addition from Building 774 and a drum elevator to transport drums to the drum counters in the addition. Currently in the stairway area there are two steel organic liquid holding tanks for waste operations in Room 210.

The third addition, Room 212 built in 1965, is a 28 by 16 foot storage facility that was constructed at the northwest corner of Room 210. Associated with this construction was an open-metal grating L-shaped dock that extended 32 feet from the original building and was 14 feet wide. To the east the dock extended to the west hatch. The storage facility is a pre-engineered corrugated metal structure with translucent skylight panels in the roof. There was a man door in the southeast corner of the facility and a sliding door at the north that accesses the dock. This facility is used to store and pneumatically transport solid chemicals used in a waste treatment process in room 210.

The fourth addition, built in 1967, is a 31 ft wide X 55 ft long X 30 ft high two-story facility built to the east of the original building and attached at the southeast corner. Part of the south wall of this facility is built next to the north wall of the north 12,000 gallon concrete storage tank. The ground floor (second floor) is an eight-inch thick slab built on grade with two reinforced concrete support columns for the process equipment that is no longer installed. The third floor is supported by six poured-in-place reinforced concrete beams tied into twelve outside vertical columns that are made of reinforced concrete. The floor is a six-inch reinforced slab with two openings in it to the second floor. One is on the east side and covers the entire width of the addition. The second is in the middle of the room. The walls of the second floor are poured-in-place reinforced concrete. The walls of the third floor are cement block filling the space between the vertical columns. A reinforced concrete lentil was poured on top of the vertical columns to support the pre-stressed, twin-tee roof panels. In the northwest corner of the third floor, Room 320, is an office constructed of concrete blocks. In the northeast corner next to opening in the floor is the filter plenum for this addition. The east side of Room 220 has a 3' 4" high steel wall that acted as a containment wall for the two feed tanks for the process. After the process equipment was removed, the tanks were converted for use as holding tanks for PCB contaminated liquids for offsite shipping and destruction. On the roof, centered over the north edge of the opening in the middle of the floor, is a 44-foot high exhaust stack held in place by eight guy wires.

The 60 by 28 foot dock associated with this addition was covered in 1969, the fifth addition to the building, using steel support beams bolted to the north wall of the addition and the dock floor. These support beams support a steel framework that is covered with Transite® containing six translucent panels. The edge of the roof is sealed to the addition and the original building using lead flashing, aluminum over flashing, and asbestos putty. The eave and east side of the roof is J-M type W eave trim held in place with lead-headed bolts. The roof and Transite® wall are sealed with Perm-Seal filler strip and asbestos putty. There are three rollup doors mounted to steel framework in the walls of the covered dock. Two are on the north wall and one at grade on the east wall.

In 1969 a sixth addition, 29 ft long X 27 ft wide X 14 ft high at the roof peak, was built on top of the original building at the northeast corner that became the men's restroom, locker room, and shower room. Access to this addition is by a stairway from room 206. A door was cut in the original outside wall next to the entrance to Room 206, and a hole was cut in the roof of the original building to enter the addition. Currently the addition is used as a break-lunch room and offices.

The walls of the addition are constructed of lightweight concrete blocks with the exterior walls 8 inches thick and the interior walls 4 inches thick. A bond beam caps all 8" block walls at eave height. All curbing for the walls is one-foot high lightweight concrete.

A 3" floor of lightweight concrete was poured over the existing roof, after the existing roofing material was removed, as the floor for the addition. In the area where the shower and restroom is located a sheet of Saraloy® 660 polyethylene film was placed under the lightweight concrete slab. Wire reinforcing mesh was placed in the slab, and the slab was covered with Markay® flooring throughout.

The roof is Inland® type A galvanized 20ga, roof decking with the rib side up over 1 ½" roll insulation sloping to the north and south. A gutter is on the north side with a downspout going to a splash block at ground level. The roof decking is supported by bar joists.

Ceilings in the shower and restrooms are ½" fire retardant gypsum board attached to 2" by 4" metal joists. The ceiling in the rest of the addition is fire resistant, suspended 2' by 4'ceiling panel construction.

HVAC for the addition is supplied by a unit mounted above the drop ceiling on supports from the roof joists. The intake is on the east side of the addition. The condenser unit is mounted on supports on the roof of the original building to the south of the addition.

In 1973 a seventh addition, 54'wide 64'long X 54'high, was built south of the original building. This addition is three stories high with the bottom floor elevation the same as the floor of the second floor of the original building. The concrete tanks that were south of the building were removed as waste and the entrance to the valve vault for these tanks became the entrance to the new addition.

The outside foundation walls and two 22" diameter interior columns have 3' caissons supporting them. There are 19 of these caissons. Twelve 2' caissons are centered under the center of the four 15,000-gallon waste tank saddle supports, one corner of the stairwell, and three 12" square columns. Three foot high by 1 ½ ' thick grade beams placed on top of all caissons were separated from the top of the caisson and the ground underneath them by 4" type J-void material.

The floor slab was tied into the grade beam with rebar and separated from the ground with 4" type J-void material. A vapor barrier was placed between the slab and the type J-void material. Tank supports were keyed and tied into the floor with rebar. All other equipment bases were tied to the floor with rebar. The outside walls were keyed into the floor slab.

The outside wall next to the original building is one foot thick. The other three walls are 1 ½' thick up to the third floor and one foot thick the rest of the way to the top of the wall in the fourth floor where the east and west walls are recessed 6" to support the twin-tee prestressed concrete roof panels.

The 12" square columns support a one-foot thick floor that is 12' 10" above the second floor. This floor is tied into the third floor with an eight-inch reinforced concrete wall on three sides. A curb eight inches thick and one foot high above the third floor level supports a cement block wall to the third-floor ceiling to make a room, Room 342, in this area of the addition. The room is 32 ft long by 16 ft wide. The floor has four 4' 10" openings in it through which mixing tanks for chemicals are installed. These openings have a 4" thick by 6" high curb around them. This room has a door in the east wall that leads outside to the same elevation as the chemical storage shed that is over the concrete tanks.

The third and fourth floor walls are one-foot thick and are keyed into the floor beneath them. The 22" diameter columns that support the third floor become 16" in diameter at the third floor to support the fourth floor. The third and fourth floor have a " waffle" slab. On the third floor at the southeast corner is an airlock that opens up on to a loading dock. Also in this corner is an interior enclosed stairwell made of cast-in-place concrete that go to the second and fourth floors. Room 341 occupies the rest of the third floor and has a 3" concrete pad on the west side that is the base for Filter Plenum 202. This plenum is the exhaust for the hot equipment in the building.

On the fourth floor in Room 441 in the northwest corner is a 3" pad that supports Filter Plenum 201, the building supply plenum. In the southwest corner is an airlock that goes out to a loading dock on the south side of the addition. To the east of the dock is a concrete pad that supports the A/C condenser. In the southeast corner is an enclosed cast-in-place stairwell that goes to the second and third floor.

Outside the addition at the northeast corner is a metal grating stairwell, supported by a steel framework and covered with aluminum siding that goes from the fourth floor to the roof of the original building. This stairwell is the emergency exit for the fourth and third floors.

In 1987 the metal grating deck between Hatch A and Room 212 was removed, Hatch A was sealed, and an eighth addition was built in this part of the building. It is an L-shaped addition that is 45 ft wide by 52 ft long by 17 ft high. The short leg of the L is 15 ft long by 17 ft wide, and it is built north of the addition that contains Rooms 206, 207 and 208. The addition was constructed of reinforced concrete. Provisions were made structurally to add a 34 ft X 36 ft third floor if the need arose.

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There are twenty one 18" caissons around the edge of the addition that support two different size grade beams and three 36" caissons that support where the northern edge of the proposed third floor would be. All caissons were drilled 6' into weathered bedrock. Twelve 18" caissons are next to the existing additions or the original building and support a 31" X 30" grade beam whose top is the same elevation as the finished floor of the addition. Nine 18" caissons support a 1'6" X 2' 6" grade beam around the rest of the addition and whose top is 6'6" below the elevation of the finished floor. Two of the 36" caissons are capped with a 1' 6" thick 4' square cap whose top is one foot below the finished floor. This supports a 12" square column that supports the roof. The third 36" caisson supports a 1' 6" thick 4' square cap whose top is 6' 6" below the finished floor elevation. On top of this cap is a 2'7" X 4' column that ties into the 31' X 30" grade beam. Eighteen by eighteen inch tie beams are tied into the 31' X 30" grade beam. The grade beams support the 8" reinforced concrete walls for the addition whose top of wall is 17' above the finished floor.

The floor slab is 6" thick with 6" X 6" wire fabric reinforcing in it.

Four one-foot wide by two-foot high reinforced concrete beams, which are supported by the 12" square columns, supports the roof slab. The roof slab is 8" thick reinforced concrete with the top of the slab one foot below the top of the walls. In the area where the third floor could be built the roof is flat. The rest of the roof slopes to the north to an elevation of 2' 4" below the top of the wall.

On the east side of the small leg is Room 251. The wall for this room is gypsum board over metal studs. Entrance to this addition is through the double door in the north wall of Room 202. There is a double door in the middle of the north wall and a single door in the west wall that leads to the dock to the north of Room 212. The door that was in the east wall of room 212 was closed off when this addition was built.

The exposed walls that are not next to an existing wall are insulated with 2 inches of ridged insulation covered with 22 ga alumnium panels. The roof is covered with ridged insulation, a membrane, and asphalt and gravel.

2.2.1.2 Walls

Most walls in Building 774 are reinforced concrete. The exceptions to this are: (1) Room 210 has metal panels on three sides; (2) Rooms 202A, 206, 207, 208, 209, 201, 104, 320, 301, 302, 303, 304, 304A, 305, 306, 321, 343, 344, 442 and 443 are lightweight concrete block; (3) Rooms 212 and 322, the chemical storage sheds, are corrugated metal; and (4) Rooms 105, 204 and 251, and the air lock at the northeast corner of Room 203 have some of their walls made of gypsum board. The walls in Room 321 are covered with sound deadening material to reduce the noise level of the equipment in Room 320. With the exception of the metal walls, all walls are painted.

2.2.1.3 Floors

Most floors in the building are concrete. The exception to this is the floors in Rooms 204 and 321. Room 204 has vinyl tile, and Room 321 is carpeted. The concrete floors are either on grade or part of a multi-story addition. Floor thickness varies from eight to six inches thick, and all are reinforced. Some are supported by beams or, as in the case of the third and fourth floors in the south addition, use of waffle-slab construction and support columns. All floors are painted.

2.2.1.4 Ceilings

Most ceilings in the building are painted concrete. The exceptions to this are Rooms 210, 212, 301, 302, 303, 304, 304A, 305, 306 and 321. Room 210 is the metal pan for the concrete roof. Room 212 is the underside of the corrugated roof. Rooms 305 and 306 are gypsum board attached to metal studs. All the rest are suspended acoustical ceiling panels. The ceiling above the drop ceiling in Room 321 has sound deadening material to reduce the noise from the equipment in Room 320.

2.2.1.5 Roof

The roofs of the building are reinforced concrete slabs or pre-stressed twin-tee reinforced concrete panels covered with ridged insulation, membrane or felt, and asphalt and gravel. The exception is the roof over Room 212 and the third floor break room and office. The roof over Room 212 is corrugated metal. The roof over the break room and office is a ribbed metal roof over insulation.

2.2.1.6 Doors

There are 37 personnel doors in Building 774 of various types. All doors are hollow metal with or with out windows in them and/or louvers in them. The windows are glass with wire-mesh reinforcing in it, and could be two pains in the top half of the door or a 10" by10" window at eye-level. The louvered doors are used in the restroom and shower doors. Most outside doors are without windows. Only the main entrances to the building have windows in them, and some of the interior doors in the original building. The three dock doors are wall-mounted steel rollup doors.

2.2.1.7 Utilities

Steam, 480-volt electricity, and compressed air are supplied from B771. House vacuum is supplied from equipment in the building. There is an uninterruptible power supply (UPS) in the building in Room 441. Presently the UPS system is non-operational. Other utilities to the building include water, sanitary lines, and LSDW and alarms.

2.2.1.8 Heating, Ventilation and Air Conditioning (HVAC)

There are two HVAC systems and two ventilation systems in the building. One ventilation system exhausts air from Rooms 220 and 320 through Plenum 320A. The other system, located in Room 341, exhausts air from the gloveboxes and equipment in the hot side of the building and exhausts through a four stage filter plenum to outlet louvers in the west wall of this addition. One HVAC system supplies the air to Rooms

301, 302, 303, 304, 304A, 305 and 306. This system is suspended above the ceiling in these rooms. The other, located in Room 441, supplies the rest of the building. Air is recirculated in the building by passing it through two stages of filtration, heating and/or cooling as needed before it is sent to the various rooms. Ten percent of the air is vented to the outside, and makeup air is treated and bleeds into the system. Intake and exhaust louvers for this system are located on the west side of the addition.

2.2.2 Historical Processes

Building 774 was built to treat acidic and caustic wastes generated in the production buildings on plant site. The high-level alpha activity, acidic wastes from B771 were neutralized in the first stage process using the caustic waste from B771 and adding sodium hydroxide, as needed, with chemicals that would coprecipitate and remove the plutonium from the waste solutions. The resulting waste was filtered on a rotary drum vacuum filter. Solids were collected in a lined drum and sent off site as transuranic waste. The effluent was sent to the second stage process where the waste was treated further and then sampled. If the waste was still high in alpha activity, it was returned to the first-stage process and precipitated again. The second stage also received low-activity waste from the rest of the plant site. Low-activity wastes were precipitated and filtered on a rotary vacuum filter. Solids from this stage were collected in lined drums and sent off site as low-level waste. The effluent was sent to the solar ponds.

In 1967 a thermal siphon evaporator and double-drum dryer were installed in the addition built that year. Wastes from the solar pond were pumped to the feed storage tanks in the addition and evaporated. The concentrate was sent to the drum dryer. The resulting salts were put into lined boxes and shipped off site as low level waste. The steam from this operation was condensed and sent to Tanks 774A and 774B for site release. When the evaporators in B374 started operation, this process was discontinued, and the equipment was removed.

The processes performed in the Room 210 addition were set up to treat aqueous and organic wastes that could not be treated by simple neutralization and precipitation. Aqueous wastes are received in 4-liter bottles. The bottles are put into the "bottle box" glovebox where the contents are vacuum transferred to a tank, neutralized, and then drained into a lined drum containing cement and mixed with a rod to a hardened mass. The drums of cement are shipped off site as transuranic waste.

The organic waste was originally mixed with Microcell® and extruded into a lined drum and sent off site as radioactive waste. The process later consisted of mixing the organic waste with cement, Envirostone®, and an accelerator, and putting it into a lined drum and shipping the drum off site as radioactive waste.

2.2.3 Current Status

The second stage process and the process to treat aqueous wastes are still active. Tanks also are currently being drained.

3.0 SUMMARY OF CHARACTERIZATION ACTIVITIES

The hazards characterization for B771 and B774 was designed to determine if levels of radiological contamination are below the Derived Concentration Guideline Levels (DCGLs) and if the facilities can be released without restrictions and/or disposed of as sanitary waste/construction debris. This section of the Hazards Characterization Report presents data quality objectives (DQOs) used, historical and process knowledge and existing data, and additional characterization performed to fill data gaps. Section 3.0 also describes the survey units used to characterize the facilities, and defines the methods used to perform radiological surveys, scans and sampling. The hazards characterization followed the guidance provided in the Site Reconnaissance Level Characterization Plan (RLCP).

3.1 Data Quality Objectives

The following section revisits the original DQOs used in designing the Characterization Package.

The Problem

The problem consists of the unknown volume of floors, walls, ceilings and roofing, and the unknown extent of radiological and chemical contamination on and in floors, walls (interior and exterior), ceilings and roofing (i.e., whether or not the facilities can be released).

The Decision

The decision is whether release criteria for radiological and chemical constituents are met (see Decision Rules below), based on types and quantities of any radiological and chemical contamination present.

Inputs to the Decision

The inputs to the decision include historical and process knowledge; data collected from this hazards characterization; and release criteria and waste management regulations (see Decision Rules below).

Decision Boundaries

The decision boundaries are the spatial confines of the facilities, including foundations, floors, walls, ceilings, roofing and any fixed equipment associated with B771 and B774, including the 771/774 waste transfer tunnel and the 771/776 tunnel. Interior and exterior surfaces are included, including those below grade. Environmental media were not considered within the project boundaries.

Decision Rules

This section presents the rules to support the characterization decisions, specific to each type of contamination. Decision rules are applied based on process knowledge, facility walkdowns, radiological surveys and scans, and radiological and chemical sampling and analysis results.

Radionuclides

- If all radiological survey and scan measurements are below the surface contamination guidelines provided in DOE Order 5400.5 (Radiation Protection of the Public and Environment), the related surface is considered not radiologically contaminated.
- If any radiological survey or scan measurement exceeds the surface contamination guidelines provided in DOE Order 5400.5, the related survey unit must be evaluated per the statistical tests described in Section 7.0 of the RFETS Pre-Demolition Survey Plan.
- If any radiological sample measurement exceeds the volume contamination thresholds provided in the NRA Verification Program (refer to Kaiser-Hill letter to DOE, RFFO, Application of Surface Contamination Guidelines from Department of Energy Order 5400.5 - WAH-064-98, March 10, 1998), the related volume is classified as radiologically contaminated.

Hazardous Waste

If decommissioning waste is mixed with or contains a listed hazardous waste, or if the waste exhibits a characteristic of a hazardous waste, then the waste is considered hazardous waste in accordance with 6 CCR 1007-3, Part 261 and 268.

Hazardous Substances

If material contains a listed hazardous substance above the CERCLA reportable quantity (40 CFR 302.4), the material is subject to CERCLA regulation (i.e., notification requirements).

Beryllium

If surface concentrations of beryllium are equal to or greater than 0.2 $\mu g/100\ cm^2$, the material is considered beryllium contaminated.

Polychlorinated Biphenyls (PCBs)

- If material contains PCBs from the manufacturing process at concentrations ≥ 50 ppm, the material is considered PCB Bulk Product Waste and subject to the requirements of 40 CFR 761.
- If PCB contamination from a past spill/release is suspected, or if a PCB spill is discovered that has not been cleaned up, the associated material is considered PCB Remediation Waste and subject to the requirements of 40 CFR 761. PCB remediation waste includes: materials disposed of prior to April 18, 1978, that are currently at concentrations ≥ 50 ppm PCBs, regardless of the concentration of the original spill; materials which are currently at any volume or concentration where the original

source was ≥500 ppm PCBs beginning on April 18, 1978, or ≥50 ppm PCBs beginning on July 2, 1979; and materials which are currently at any concentration if the PCBs are spilled or released from a source not authorized for use under 40 CFR 761.

- If a waste or item contains PCBs in regulated concentrations, the waste or item is considered PCB-regulated material and subject to the requirements of 40 CFR 761.

Asbestos

If any one sample of a sample set representing a homogeneous medium results in a positive detection for asbestos (i.e., >1% by volume), then material is considered asbestos containing material (ACM; 40 CFR 763 and 5 CCR 1001-10).

Tolerable Limits on Decision Error

Tolerable limits on decision error (95% confidence) are applied to the design of survey and sampling plans, as well as actual measurement data resulting from implementation of the plans. Survey area size limits are based upon the requirements of Table 1 of PRO-475-RSP-16.01. Survey areas were developed based on current radiological postings, the procedurally driven size limitations, function and use of area, and where possible, maintaining contiguous survey areas.

Decision error does not apply to asbestos sample sets per 40 CFR 763. Results are compared with the decision rule on a sample-by-sample basis.

Optimization of Plan Design

Radiological characterization was conducted on interior floors, walls and ceilings, and exterior walls and roofs as necessary. The following criteria were used to develop the radiological survey/sampling characterization package:

- Radiological field measurement methods and instrumentation are described in Section 3.0 of the Site RLCP (MAN-077-DDCP, Appendix D).
- Radiological sampling and preparation for laboratory measurements are described in Section 3.0 of the Site RLCP (MAN-077-DDCP, Appendix D).

If hazardous waste, hazardous substance, beryllium, PCB or asbestos surveys/samples are required, sampling and analysis are conducted in accordance with Section 4.0 of the RLCP.

3.2 Radiological Characterization

Radiological characterization was performed to define the nature and extent of radioactive contamination that may be present on or in B771 and B774. This section discusses how the characterization was conducted. Radiological hazards are discussed in Section 4.0, and sample results are presented on posting plots (see Attachment B).

Characterization data summaries and radiological survey packages are maintained in the 771 Closure Project file.

3.2.1 Summary of Historical Information

Historical information on radiological contamination within B771 and B774 is presented in the Building 771/774 Reconnaissance Level Characterization Report (RLCR), dated August 8, 1998. Radioactive contamination is present on surfaces (e.g., floors, walls and equipment) and in equipment and building systems (e.g., gloveboxes, process tanks and lines, and ventilation ducts/plenums).

3.2.2 Summary of Supplemental Data Collected

Process history indicates the use of DOE-added radioactive material in most areas of B771 and B774, and contamination throughout (with the exception of some administrative areas and the building exterior). Supplemental data were collected to support D&D planning by estimating the areas requiring intrusive D&D (e.g., surface media removal by scabbling/hydrolazing). Accordingly, the desired data were sample (surface media) data. Pre- and post-sample total surface activity (TSA) and removable surface activity (smear) measurements were collected for radiological control purposes and to determine if additional contamination existed beneath the paint. Surface scans were not performed because surficial radiological conditions are expected to change during the course of D&D. A summary of the data collected by survey unit is provided in Table 3-1. Overview maps delineating the areas represented by each survey unit are presented in Attachment A.

3.2.3 Sampling and Field Measurement Methods, Procedures and Equipment

Measurements were performed to evaluate the contaminants of concern (i.e., Pu-239 and Am-241 -- transuranic alpha-emitters). The TSA measurements were collected with a NE Electra using a DP-6 probe (90-second counts). Removable activity measurements were analyzed with an Eberline SAC-4 (two-minute counts). Samples were collected utilizing site-approved methods and procedures, and analyzed for Pu-239 and Am-241.

Specific survey/sample locations were typically selected using a random number generator (except as noted in Table 3-1). If a random location was inaccessible, the measurement was obtained as close as possible to the original location, and the new location was annotated on the survey map.

Measurement locations were clearly identified with labels or permanent markings to provide a method of referencing survey results to survey measurement locations. These measurement locations were incorporated into a grid map with a one-square meter reference coordinate system.

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Table 3-1 Summary of Radiological Data Collected for B771 and B774

Survey Area	Survey Unit (5 & 9)	Class	Description	# TSAs/ Smears	# Media Samples
AD	771031	2	Maintenance Shop	15	15
	771032	2	Administration Area	15	15
	771033	2	Cafeteria, Corridor F and Associated Offices	15	15
	771034	2	Locker Rooms	15	15
AB	771035	2	771C (Annex), Rooms 303, 305, 306, 308 and 309	15	15
	771036	2	771C (Annex), Rooms 301 and 304	15	15
AH	771038	2	Rooms 232, 233, 234, 235, 236, 237, 238 and 238A	15	15
	771039	2	Rooms 239, 240, 240A, 240B, 240C, 240D, 240E and 240G	15	15
	771040	2	Rooms 229, 230, 231, 241, 242, 245, 246, 246A and 247	15	15
	771041	2	Plenum Area (West)	15	15
	771042	2	280, 280A, 280B, 281A and 281B (Main Exhaust Plenum and Airlocks)	Samples not collected. Contamination anticipated.	
	771043	2	Rooms 282, 282A-C and 283A-J	15	15
	771044	2	Plenum Area (East)	15	15
AM	771045	2	Rooms 204, 205, 206, 207 and 208	0 (1)	0 (1)
	771046	2	Rooms 212, 250 and 251	0 (1)	0 (1)
	771047	2	Rooms 202A, 301, 302, 303, 303A, 304, 305, and 306	0 (1)	0 (1)
	771048	2	Rooms 343 and 443	0 (1)	0 (1)
	771049	2	200 East Dock, Caustic Storage, Dock, 304 Hallway, and Penthouse	0 (1)	0 (1)
	771050	2	Room 102	Samples not collected. Contamination anticipated.	
	771051	2	Rooms 101, 103 and 201	15	15
	771052	2	Rooms 202, 209 and 209 Airlock	15	15
	771053	2	Rooms 104, 105 and 220	15	15
	771054	2	Room 241	15	15
	771055	2	Rooms 320, 321 and 322	15	15
	771056	2	Room 341	15	15
	771057	2	Room 441	15	15
	771058	2	Rooms 342, 442 and UST Pad	15	15
	771059	2	Rooms 203 and 210	Samples not collected. Contamination anticipated.	
AE	N/A	1	B771 Contamination Area, West Side	30	30
AF	N/A	1	B771 Contamination Area, East Side	7 (2)	7 (2)
AL	N/A	2	B771/B774 Roof	0	20 (3)

(1) No samples were collected in areas where painted-over contamination does not exist, based on process history or the absence of paint.
(2) Additional samples will be collected prior to decontamination and/or waste disposition.
(3) Biased samples were collected (area with highest potential for contamination due to airborne deposition).

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3.2.4 Laboratory Analysis

The collected samples were submitted to RFETS laboratories and/or approved contracted laboratories and were analyzed via a Site-approved method (see Section 6.2.3). The laboratories have an established quality assurance/quality control program that assures the validity of the analytical results. The laboratory analytical methods used are capable of measuring levels at or below 50% of the established release criteria. All results state the detection limit for the analysis.

3.3 Chemical Characterization

Chemical characterization was performed to determine the nature and extent of chemical contamination that may be present on or in the B771 and B774. Characterization was based on a review of historical and process knowledge, visual inspections, and additional data collection to fill data gaps. No historical data are available on these facilities. Historical information and the need for additional sampling and analysis are discussed in this section. Related hazards are discussed in Section 4.0.

3.3.1 Summary of Historical Information

Information on chemical contaminants of concern (e.g., asbestos, beryllium, RCRA/CERCLA constituents, lead in paint, and PCBs) is presented below.

Asbestos: Limited historical asbestos inspection data exist for B771 and B774. However, based on the age of the buildings, the presence of asbestos-containing materials is suspected in both buildings. Therefore, an asbestos inspection of the buildings and sampling and analysis of suspect materials were required.

Beryllium: According to the Location of Known Beryllium Areas (Historical and Present), beryllium was present in the following rooms within B771: 114, 146, 152, 154, 156, 158, 162 and 165. Plenum FU2 in Room 249 and the main plenum in Room 283 could have been contaminated by operations where beryllium was present. In addition, the following rooms within B774 are listed: 103, 202, 203, 210, 211 and 220. Tanks and process lines also could be contaminated.

Based on extensive beryllium surveys throughout B771 and B774, no beryllium contamination is present on building surfaces, except on Tank 1A in B774, Room 202 (i.e., concentrations are < 0.2 $\mu g/100\ cm^2$; except the concentration on Tank 1A was 0.39 $\mu g/100\ cm^2$ in 1998). However, beryllium contamination may be present in process equipment (i.e., gloveboxes and tanks), process lines, and exhaust ventilation. Surveys are currently being performed to verify contamination, and some areas and equipment are being de-posted based on survey results. Survey results are presented in the Industrial Hygiene Information System (for new data) and the report entitled B771/774 K-H Beryllium Report, September 1999. Based on the extensive beryllium data, beryllium sampling was not conducted as part of this characterization effort.

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RCRA/CERCLA Constituents (including metals, organic compounds, and other hazardous materials): According to historical and process knowledge, RCRA/CERCLA constituents may be present in both B771 and B774. Processes in B771 involved hazardous substances, and hazardous wastes have been stored in numerous areas within B771. Also, B774 treated and stored a variety of hazardous wastes. In addition, numerous releases and spills containing hazardous substances and wastes reportedly have occurred in the past in both buildings. However, there are no historical data to characterize chemical contamination.

There are eight CERCLA waste storage units in B771/B774 and one CERCLA treatment unit (i.e., drum crusher in B771, Room 172). These units were RCRA units, but are now empty of RCRA waste (i.e., RCRA stable). Lists of idle equipment containing hazardous substances/wastes, mixed residue tanks, and RCRA permitted and interim status treatment and storage units are included in the 771 Closure Project Decommissioning Operations Plan, Modification 3, and Proposed Action Memorandum for Under Building Contamination Remediation, February 28, 2001 (refer to Tables 7, 8 and 10, respectively).

No sampling for hazardous substance analysis was conducted during this characterization effort. No obvious chemical staining was observed during facility walkdowns, and spills of hazardous substances and wastes generally have been cleaned up as they have occurred. Also, most of the paints in the B771 process areas and in B774 [i.e., in all the radiological contamination areas (CAs) in both buildings] will be removed. In addition, process equipment, tanks and process lines will be characterized generally via process knowledge and in more detail during in-process characterization. Therefore, facility surfaces (e.g., floors) will be sampled for hazardous substance analysis, as necessary, during in-process characterization after gloveboxes, other equipment, tanks, product and waste containers, and paints have been removed.

Lead and other toxic metals in paint: No information exists on the metal content of paints on B771 and B774 surfaces. However, based on the age of the facilities, toxic metals could be present in building paints. Therefore, numerous samples were collected from walls and floors within the B771 process areas and B774, including the 771/776 tunnel (i.e., 61 samples + 6 duplicates from CAs, where paints will be removed). Data will enable complaint waste management. However, paints outside the CAs and the high contamination areas (HCAs) were not sampled and analyzed. Project plans indicate that paints from these areas will not be removed. Environmental Waste Compliance Guidance #27, Lead-based Paint (LBP) and Lead-based Paint Debris Disposal, states that LBP debris generated outside of high contamination areas shall be managed as non-hazardous (solid) wastes and need not be sampled unless the potentially lead-containing component is to be scabbled or otherwise comprise a separate waste stream.

Polychlorinated Biphenyls (PCBs): No sampling for PCB analysis was conducted during this characterization effort. There are no records indicating historical releases/spills of PCBs in the buildings, and no obvious staining was observed during facility walkdowns. Releases/spills generally have been cleaned up as they have

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occurred. Also, most of the floors in the B771 process areas and in B774 will be scabbled. In addition, equipment interiors will be characterized generally via process knowledge and in more detail during in-process characterization. Facility surfaces will be sampled and analyzed for PCBs, as necessary, during in-process characterization after process equipment have been removed and areas scabbled.

Based on the age of the buildings, some paints on facility surfaces may contain PCBs at concentrations ≥ 50 ppm. Therefore, numerous paint samples were collected from walls and floors within the B771 process areas and B774, including the 771/776 tunnel (i.e., 61 samples + 6 duplicates from CAs, where paints will be removed). Additional sampling and analysis will be conducted to characterize non-CAs as necessary during in-process characterization. However, based on Environmental Waste Compliance Guidance #25, Management of Polychlorinated Biphenyls (PCBs) in Paint and Other Bulk Product Waste During Facility Disposition, paints on surfaces do not need to be sampled and analyzed if they remain on their substrates and are disposed of a PCB Bulk Product Waste.

3.3.2 Summary of Additional Data Collected

Based on historical and process knowledge presented in Sections 2.0 and 3.3.1, and the inspections conducted, the only chemical data collection required was analysis of suspect asbestos-containing material and analysis of paint samples for toxic metals and PCBs. An asbestos inspection of the facilities was conducted by a CDPHE-certified asbestos inspector. A total of 255 samples were acquired from suspect material. Results of the inspection and follow-up sampling and analysis are summarized in Section 4.0 and fully documented in the Asbestos Characterization Report for Building 771/774, which is maintained in the 771 Closure Project File. Numerous paint samples also were collected. Results are presented in Section 4.0, and data are maintained in the 771 Closure Project File.

4.0 HAZARDS

This section discusses physical, radiological and chemical hazards, including results from field measurements and laboratory analysis. Radiological sample results are also presented on posting plots in Attachment B. Radiological data summaries and survey packages are maintained in the 771 Closure Project file.

The hazards characterization confirmed that both facilities contain radiological hazards and contamination above the release limits prescribed in DOE Order 5400.5 and the RFETS Radiological Control Manual. Characterization results are summarized in Section 4.1.

For each facility, the potential for a chemical hazard due to each of the following contaminants was considered:

- asbestos and silica;
- beryllium;
- lead and other toxic metals;
- organic and other inorganic compounds; and
- PCBs.

Each potential chemical hazard was evaluated primarily based upon historical and process knowledge coupled with visual inspections (refer to Section 3.3). In addition, each facility was inspected for asbestos-containing material (ACM) and chemical spills, including PCB leaks from PCB light ballasts. Numerous samples were taken and analyzed for ACM. Numerous paint samples also were collected and analyzed for toxic metals and PCBs. Chemical hazards are presented by chemical in Section 4.2.

Physical hazards associated with the two facilities consist of those common to standard industrial environments and include hazards associated with energized systems, utilities, compressed gas, diesel fuel, and trips and falls. There are no unique hazards associated with the facilities. The buildings have been relatively well maintained and are in good physical condition, and therefore, do not present hazards associated with building deterioration. Physical hazards are controlled by the Site Occupational Safety and Industrial Hygiene Program, which is based on OSHA regulations, DOE orders, and standard industry practices.

Note that some hazards can change before the facilities are dispositioned. Operations, including building deactivation, are still on going within the facilities. For example, types and quantities of hazardous materials and their locations may change. Also, levels of contamination in different areas may increase or decrease. However, in general, hazards are continuously being reduced and will be significantly less prior to demolition. Hazard characterization will continue until completion of the Pre-Demolition Survey. In addition, isolation control will be instituted to ensure that uncontaminated and decontaminated areas remain free of contamination.

The foundations of both facilities could have been contaminated by Individual Hazardous Waste Sites (IHSSs) and Under Building Contamination (UBC). Impacts will be defined during future investigation of the UBC and IHSSs, in-process characterization and the Pre-Demolition Survey, and/or characterization of demolition debris when building foundations are removed. UBCs and IHSSs associated with B771 and B774 are described in Attachment C.

4.1 Radiological Hazards

Both facilities contain radiological contamination above the release limits prescribed in DOE Order 5400.5 and the RFETS Radiological Control Manual. Measurement and sample results are summarized in Table 4-1 by survey units and areas. Sample results are also shown on posting plots in Attachment B. Radioactive contamination is present on surfaces (e.g., floors, walls and equipment) and in equipment and building systems (e.g., gloveboxes, process tanks and lines, and ventilation ducts/plenums). Some areas and equipment/systems have high levels of radioactive contamination. Also, radiological hazards are associated with the presence of in-process nuclear material, nuclear material holdup, other radioactive materials (e.g., containerized special nuclear material and calibration sources), and radioactive and mixed waste (refer to the Building 771/774 Reconnaissance Level Characterization Report (RLCR), dated August 8, 1998).

4.2 Chemical Hazards

4.2.1 Asbestos and Silica

B771 and B774 contain a significant amount of asbestos in non-friable and friable forms. Asbestos-containing material includes pipe insulation, ceiling and floor tile, drywall, cement board, roofing material, and flashing. Some of the asbestos is damaged. The friable and damaged asbestos presents a significant abatement hazard. The results of the asbestos inspection and sample analysis, including the location of asbestos, the type of asbestos found, and the related hazard are presented in the Asbestos Characterization Report For Building.771/774 which is maintained in the 771 Closure Project RLC file. Volume estimates are presented in Table 5-1.

Various levels of silica are present in the B771/B774 concrete and can present a hazard during dismantlement and demolition operations. Data on silica levels are maintained by B771 Industrial Hygiene.

Table 4-1 Summary of Radiological Hazards by B771 and B774 Survey Unit

Survey Unit	Description	Data Results (fromTSA, smears and media samples)	Areas Requiring Paint Removal	Surface Area (m²)	Additional Scabbling Required?	Additional Sampling Required
771031	B771 Maintenance Shop	No elevated results	None	0	None	None
771032	B771 Front Offices	No elevated results	None	0	None	None
771033	B771 Corridor F (and associated rooms) and Cafeteria	No elevated results	None	0	None	None
771034	B771 Corridor A (and associated rooms)	No elevated results	None	0	None	None
771035	Annex, Rooms 302, 303, 305, 306, 308, and 309	Elevated Results as follows (in dpm/100 cm²): Room 303 floor | 150	Room 303 floor	**134**	None	A minimum of one (1) sample. Additional sampling may be required.
771036	Annex, Rooms 301 and 304	No elevated results	None	0	None	None
771038	Rooms 232-238 and 238a	Elevated Results as follows (in dpm/100 cm²): Rooms 235 N. Wall | 300 Room 238 floor | 170	Worst case: All rooms	**3229**	Not anticipated.	May re-design survey IF justification can be provided as to why Rooms 235 and 238 have elevated readings
771039	Rooms 239, 240 and 240A-G	Elevated Results as follows (in dpm/100 cm²): Room 240C floor | 240 Room 239 N. Wall | 120 Room 239 Ceiling | 300, 360 and 510	Worst case: All rooms	**1595**	Not anticipated.	May re-design survey IF justification can be provided as to why Rooms 239 and 240C have elevated readings
771040	Rooms 229, 230, 231, 241, 242, 245, 246, 246A and 247	Elevated Results throughout.	All	**2342**	Not anticipated.	None
771041	Plenum Area (West)	Elevated Results throughout.	All	**2724**	Yes	Coring to determine depth of contamination.
771042	280, 280a, 280b, 281a & 281b (Main Exhaust Plenum & Airlocks)	Currently inaccessible. Elevated results expected throughout.				

771043	Rooms 282, 282a-C, 283a-J	Elevated Results as follows (in dpm/100 cm^2): Room 283 floor: 106	None anticipated	0	None	Add'l samples around elevated result to verify less than 100 dpm/100 cm^2 over square meter.
771044	Plenum Area (East)	Elevated Results throughout.	All	**4633**	Yes	Coring to determine depth of contamination.
771050	Room 102	Not yet sampled.	All (based on process history)	**335**	Unknown	Coring to determine depth of contamination.
771051	Rooms 101, 103 and 201	Elevated Results throughout.	All	**490**	Yes	Coring to determine depth of contamination.
771052	Rooms 202, 209 and 209 Airlock	Elevated Results throughout.	All	**620**	Yes	Coring to determine depth of contamination.
771053	Rooms 104, 105 and 220	Elevated Results throughout.	All	**617**	Yes	Coring to determine depth of contamination.
771054	Room 241	Elevated Results as follows (in dpm/100 cm^2): Room 241 floor: 377, 597, 788, 2763	Floor	**278**	Yes	Coring to determine depth of contamination.
771055	Rooms 320, 321 and 322	Elevated Results, floor and walls.	Worst case: All surfaces	**807**	Not anticipated.	May be able to exempt ceiling with additional sampling.
771056	Room 341	No elevated results	None	0	None	None
771057	Room 441	No elevated results	None	0	None	None
771058	Rooms 342, 442 and UST Pad	Elevated Results as follows (in dpm/100 cm^2): Room 342 floor: 152, 546	Room 342 floor	37	Not anticipated	Additional sampling to exempt 442, UST pad, and walls/ceiling.
771059	Rooms 203 And 210	Not yet sampled.	All (based on process history)	**747**	Unknown	Coring to determine depth of contamination.

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Area AL	B771/B774 Exterior	3 of 20 "detectable" results (highest result = 0.344 pCi/g). When converted to dpm/100 cm^2, these values exceed 100. All are less than 300 dpm/100 cm^2, and may be averaged over a square meter.	None anticipated (pending additional sample results).	0	None	Additional random sampling required, and biased sampling to assure "elevated" areas are less than 100 dpm/100 cm^2 averaged over square meter.
Area AE	West Side CA (Including 771/776 Tunnel)	Elevated Results throughout. Room 180D: results > 100 nCi/g.	All	**6559 (1)**	Yes	Add'l sampling to delineate areas > 100 nCi/g. Coring to determine depth of contamination.
Area AF	East Side Ca	Elevated Results throughout. Room 114: results > 100 nCi/g.	All	**6579 (1)**	Yes	Add'l sampling to delineate areas > 100 nCi/g. Coring to determine depth of contamination.

(1) Assumes all non-load-bearing walls are removed.

B771	
B774	
Other Structures	

4.2.2 Metals (including beryllium and lead in paint)

According to historical and process knowledge, toxic metals are present in both B771 and B774. Metals are present in solutions and sludges/residues contained in process equipment, tanks and process lines, and in waste containers. Chromates and other toxic metals, used as anti-scaling agents and biocides, also may be present in cooling water systems. In addition, metals may be present on and in building floors, within process areas (CAs), as a result of releases from process equipment, tanks, process lines, and waste containers. Specific hazards associated with process equipment, tanks, process lines, and cooling systems will be determined as part of in-process characterization before such items are removed. Hazards associated with historical releases will be determined after paints, process equipment, tanks, and waste containers have been removed.

Based on extensive beryllium surveys throughout B771 and B774, no beryllium contamination is present on building surfaces, except on Tank 1A in B774, Room 202 (i.e., concentrations are < 0.2 μg/100 cm^2; except the concentration on Tank 1A was 0.39 μg/100 cm^2 in 1998). However, beryllium contamination may be present in process equipment (i.e., gloveboxes and tanks), process lines, and exhaust ventilation, including B771, Room 249, Plenum FU2, and Room 283, Main Plenum. Surveys are currently being performed to verify contamination, and some areas and equipment are being de-posted based on survey results. Survey results are presented in the Industrial Hygiene Information System (for new data) and the report entitled B771/774 K-H Beryllium Report, September 1999.

Some paints may contain lead and other metals above RCRA toxicity characteristic levels. However, only one sample out of 61 analyzed had a metal concentration exceeding the RCRA level. One of the four paint samples taken from the exhaust tunnel had a lead concentration above the RCRA level (i.e., 22.8 ppm vs the 5 ppm limit). All paint samples from B771, B771C, B774, and the 771/776 Tunnel had metal concentrations below the RCRA levels. Refer to the analytical data maintained in the 771 Closure Project RLC file. Paints that have toxic levels of metals and that are removed from their substrate will be managed as hazardous waste pursuant to 6 CCR 1007-3. Building surfaces that contain paints with metals will be managed as non-hazardous waste if paints are not removed from their substrate, according to Environmental Waste Compliance Guidance #27, Lead-based Paint (LBP) and Lead-based Paint Debris Disposal.

Lead shielding is present in the form of plates, lead-lined gloves, and lead-lined glass windows. Related hazards will be identified and controlled before shielding items are removed. Related wastes will be managed pursuant to 6 CCR 1007-3.

Lead could be present in older electrical components, including incandescent lamps, and mercury could be present in older electrical components and thermal instrumentation, including fluorescent lamps. All hazardous waste (e.g., lead- and mercury-containing lamps) will be identified and managed pursuant to 6 CCR 1007-3.

4.2.3 Organic and Non-Metal Inorganic Compounds

According to historical and process knowledge, organic and non-metal inorganic compounds, including solvents, acidic and basic (caustic) solutions, and reactive salts, are present in both B771 and B774. Such compounds are present in solutions and sludges/residues contained in process equipment, tanks and process lines, and in product and waste containers. Such compounds also may be present on and in building floors, within process areas (CAs), as a result of releases from process equipment, tanks, process lines, and product and waste containers. Specific hazards associated with process equipment, tanks and process lines will be determined as part of in-process characterization before such items are removed. Hazards associated with historical releases will be determined after paints, process equipment, tanks, and product and waste containers have been removed.

Other hazards include:

- Hydrocarbons, such as oils, grease and other petroleum lubricants, that are present in containers as product and waste, and in process equipment (e.g., oil reservoirs); and
- Choro-fluoro-carbons (CFCs), such as freons, that are present in cooling and refrigeration units, including HVAC equipment.

4.2.4 PCBs

PCBs may be present in some equipment (e.g., in oils within hydraulic systems). All suspect equipment and equipment content will be characterized during in-process characterization prior to removal. If equipment contained PCB oils and oil stains are visible under where the equipment was located, the floor will be sampled and analyzed for PCBs. All PCB wastes, including waste oils, contaminated equipment, and PCB remediation waste, will be managed in compliance with 40 CFR 761.

Some applied paints on facility surfaces contain PCBs at concentrations ≥ 50 ppm. For example, several walls and floors within the B771 Contamination Areas (CAs) have high PCB concentrations in paint (i.e., 15 paint samples out of 39 samples collected from 14 rooms). It is not known if paints in non-CA areas have high PCB concentrations. In addition, high PCB concentrations were found in B774 (i.e., in 3 out of 4 samples from Room 102, and in 3 out of 6 samples from Room 210) and the 771/776 Tunnel (i.e., in 3 out of 4 samples). However, the samples from B771C (4 + 2 duplicates) and the exhaust tunnel (4) had undetectable levels of PCBs in paints. Refer to Table 4-2 below and the analytical data maintained in the 771 Closure Project RLC file. All removed paints and painted demolition debris will be managed in compliance with regulations governing PCB bulk product waste (i.e., 40 CFR 761).

Some fluorescent light ballasts contain PCBs. In addition, a variety of other materials, manufactured before 1980, such as other electrical components, electrical cable insulation, rubber and plastic parts, gaskets, caulking, coatings, adhesives, and plasticizers, may contain PCBs. All PCB ballasts and other PCB Bulk Product Waste will be removed and segregated prior to demolition, and managed in compliance .with Site procedures and applicable regulations (e.g., 40 CFR 761).

Table 4-2 PCB Concentrations in B771/B774 Paints.

RIN # and Event	Bldg	Room	Location-unless specified, meas. to center	Paint Colors (top-bottom)	Aroclor-1254 (UG/KG)
01N0077-001	771	114	N wl, 108" fm W, 69" up	dk wh	620
01N0077-002	771	114	E wl, 291" fm S, 55" up, near SE crn. of rm.	lt gn, dk or, lt or, lt bl	5000
01N0077-003	771	114	72-82" fm W, 188" fm N, inside berm	steel gy, gy	24000
01N0077-004	771	114	222" fm E, 168" fm S	steel gy, lt gy, md gy	220000
01N0108-001	771	146-B	E wl, NE cnr 146B, 46 - 72" up	wh, pnk, lt gn	920**U**
01N0108-005	771	146-B	Duplicate of above	Duplicate of above	550000
01N0108-002	771	146	Support 8-16" up, 170" fm W, 425" fm S	dk brn, bl	1600000
01N0108-003	771	146	58" fm W, 44" fm E, 124" fm S	lt gy, dk gy, md. gn, lt gn	14000000
01N0108-006	771	146	Duplicate of above	Duplicate of above	120000
01N0108-004	771	146	128" fm N, 213" fm E	lt gy, dull gy, lt gn/bl, gy	34000
01N0109-001	771	149	N wl, 18" fm w edge of NE door, 57" up	md pnk, lt br, wh	540 (28000 on REPREP)
01N0109-002	771	149	W wl, 372" fm N, 62" up	lt br, md gn, wh	520
01N0109-003	771	149	371" fm N, 74" fm E	lt pur, dk pur, st gy, lt gn	920000
01N0109-004	771	149	357" fm W, 736" fm N	steel gy, gy	97000
01N0116-001	771	165	N wl, 39" fm E wall, 59-68" up	wh, lt br	6500
01N0116-002	771	165	S wl, 49" fm E, 63" up	off wh, lt br	4600
01N0116-003	771	165	116" fm W, 103" fm N	md br, lt br, gr-bl	2700
01N0116-004	771	165	110" fm W, 49" fm S	lt br, lt purple	5900
01N0117-001	771	174	E int. wall, 177" fm S, 49" up	beige, tan, lt or-pnk	6900
01N0117-002	771	175	S wl, 68" fm E, 27" fm W int. wall, 26" up	beige, wh	1000**U**
01N0117-003	771	174	78" fm W, 114" fm S, 53" fm E int. wall	tk gy over 12" tile w/ mastic	26000
01N0117-004	771	174	117" fm W, 115" fm E, 128" fm N	2 lyr gy on 12" tile w/ mastic	13000
01N0118-001	771	181A	E wl, 42" fm S, 18-26" up	or-yl, lt br	45000 **(1242=60000)**
01N0118-002	771	181A	N wl, 436" fm W, 276 fm E, 1-15" up	off yl, lt gy	1200000
01N0118-003	771	181A	215" fm W, 161 fm N	4 layers, all gy	12000
01N0118-004	771	181A	NW cnr, 30" from NW door	pu, yl, st gy, lt st gy	25000
01N0135-005	771	181A	23.2 from W, 5.1 from S	lt Gy, lt Bl, dk Gy, lt ol gy	1300000
01N0125-001	771	184	N wl, 117" fm E, 146" fm W, 45-68" up	beige, lt gn, tan, wh, dk gn	19000**U (1260=40000)**
01N0125-002	771	187	W wl, 34"-68" fm S wl, 54-62" up	lt gn, gn, wh	12000
01N0125-003	771	184	65-105" fm W, 4-34" fm N	silver gy, wh, md gy	300000
01N0125-004	771	187	109-119" fm E, 53" fm S	md br, lt bl	7700000
01N0126-001	771	249	"West" wall (column), 153" fm E, 252" fm S	red, wh, lt gn 3 patches	17000
01N0126-002	771	248	W wl Pileaster, 108" fm S, 26-57" up	wh	28000000
01N0126-003	771	249	240" fm N, 247" fm Plenum FU-1-E (to the W)	md gy, ol gy, lt bn w/ oil stains	7600
01N0126-004	771	248	90" fm E, 124" fm N, 146" fm W	Steel gy over worn gy	17000000
01N0110-001	771	231	S wl, 35" fm E, 111" fm W, 64" up	wh, lt gn	4300
01N0110-002	771	237	N wl on w side of rm, 78" fm W	wh, thin gy	7700 (old=150000)
01N0110-003	771	231	97" fm W, 63" fm N, 32' fm S	br, lt bl, steel gy, gy	6500000
01N0110-004	771	237	116" fm E, 104" fm N	lt violet gy, steel gy	3500

W = Wall F = Floor **u** = undetected at the specified concentration.

Table 4-2 PCB Concentrations in B771/B774 Paints (continued).

RIN # and Event	Bldg	Room	Location-unless specified, meas. to center	Paint Colors	Aroclor-1254 (UG/KG)
01N0133-001	774	102	N wl, 4-23" fm E, 14-23" up	br-wh, lt purple	>50000
01N0133-002	774	102	E wl, 108-116" fm S, 40-52" up	dk gy, wh, lt gr	2000
01N0133-003	774	102	82-90" fm W, 42-47" fm S	lt st gy, lt vt, dk gy, 2 other gy	>50000
01N0133-004	774	102	154-165" fm E, 221-231" fm N	lt gy, purple, dk gy	>50000
01N0134-001	774	210	W wl, 183" fm S, 5-18" up	top wh, bg/lwr lt gy, dk gy, wh	>50000
01N0134-003	774	210	Duplicate of above	Duplicate of above	>50000
01N0134-002	774	210	E wl, 207-213" fm N, 4-17" up	top oily wh/lwr oily lt gy, dk gy	>50000
01N0134-004	774	210	51-56" fm W, 45-55" fm S	thick lt gy, dk gy	5900
01N0134-006	774	210	Duplicate of above	Duplicate of above	15000E
01N0134-005	774	210	121-127" fm W, 228-234" fm S	lt gy, dk gy, other gy, lt br	11000
01N0135-001	774	220	S wl, 78-85" fm E wl, 33-39" up	dk steel gy, yl-wh	20000**U**
01N0135-002	774	220	S wl, 218-225" fm E, 26-33" up	lt ol gy,yl-wh, wh	19000**U**
01N0135-003	774	220	107-117" fm E, 202-207" fm S	lt gy, orange	19000**U**
01N0135-004	774	220	141-147" fm E, 124-134" fm S	4 layers gy, orange	17000**U**
01N0145-001	771C	304	W wl, 60-107" fm N, 26-38" up	yl-wh, blk sealant, spots silver	21000**U**
01N0145-006	771C	304	Duplicate of above	Duplicate of above	21000**U**
01N0145-002	771C	305	N wl, 51-57" fm W, 77-83" fm E, 28-38" up	lt bl, lt gn	20000**U**
01N0145-004	771C	301	300" fm E, 213" fm N to center of sample	lt st gy (1 layer), sm spots red	20000**U**
01N0145-005	771C	301	Duplicate of above	Duplicate of above	21000**U**
01N0145-003	771C	303	200-207" fm E, 154-163" fm S, 93-101" fm N	lt br, dull lt gy, crimson red	21000**U**
01N0146-002	Tunnel		E wl, 180 feet fm N(771), 55-63" up	wh with blk streak	140000E, 450000D
01N0146-001	Tunnel		W wl, 125 feet fm N(771), 24" up	wh, lt gn, yl-bl	130000EP, 460000D
01N0146-004	Tunnel		175 ft fm N(771), 17-34" fm E, 62-72" fm W	lt gy, lt gy, md gy	13000
01N0146-003	Tunnel		100 ft fm N(771), 53-61" fm E, 35-43" fm W	lt gy (at least 3 layers)	>50000
01N0144-002	Ex. Tun		N wl, 32.2 from E, 2.7 up	Orange Sealant on White	20000**U**
01N0144-001	Ex. Tun		S wl, 39.3 fm. E, 3.7 up	dk ol br, ol br, oran, (gr)	18000**U**
01N0144-004	Ex. Tun		4.8 from S, 2.6 N, 38.2 E	lt brn / epoxy	20000**U**
01N0144-003	Ex. Tun		1.6 from N, 5.6 S, 102 E	lt grn-gy, rusty	17000**U**

W = Wall F = Floor **u** = undetected at the specified concentration.

5.0 DECOMMISSIONING WASTE TYPES AND VOLUME ESTIMATES

The disposition of the B771 and 774 will generate a variety of wastes. Table 5-1 presents the estimated volumes of potential wastes by facility and waste type.

After equipment has been removed from the facilities and the facilities have been decontaminated, the demolition of these facilities will generate primarily uncontaminated rubble/structural construction debris, sanitary waste, and low-level radioactive waste. Most process-related equipment items, including ventilation systems, gloveboxes, and machinery are likely to be disposed of as radioactive waste. The Site plans to recycle most or all of the uncontaminated rubble/structural construction debris. Relatively small amounts of hazardous, toxic and asbestos-containing waste are anticipated. All demolition debris and PCB light ballasts will be managed in compliance with regulations governing PCBs (40 CFR 761), in accordance with the Decommissioning Program Plan, Section 3.3.5, as applicable. Asbestos containing material, and all hazardous and toxic waste will be removed and disposed of in compliance with EPA and CDPHE regulations.

Table 5-1 Estimated Waste Volumes by Waste Type and Facility

Facility	Concrete	Wood	Metal	Corrugated/ Sheet Metal	Wall Board	ACM	Other Waste
B771	215,510 cu ft	0 cu ft	2,408 cu ft	0 cu ft	10,406 cu ft	Pipe insulation – 3,530 sq ft Fittings – 1,410 Ceiling tile – 40 sq ft Drywall – 4,320 sq ft Cement board – 9,440 sq ft Floor tile – 37,500 sq ft Window putty – 34 sq ft Vermiculite fill -- 900 sq ft Caulk/rope -- 36 sq ft Glue pad – 1,790 sq ft Coating – 4,500 sq ft Glue – 300 sq ft Roofing – 480 sq ft Flashing – 2,600 sq ft	Concrete block 44,947 cu ft
B774	54,792 cu ft	0 cu ft	1,700 cu ft	0 cu ft	439 cu ft	Insulation – 630 sq ft Fittings – 320 Cement board – 4,470 sq ft Floor tile – 230 sq ft Roofing – 2,250 sq ft Flashing – 600 sq ft Silver painted rock -- 2,000 sq ft	Cement block 3,623 cu ft
771/774 Waste Transfer Tunnel	1,360 cu ft	0 cu ft	0 cu ft	0 cu ft	0 cu ft	Not determined	0 cu ft
771/776 Tunnel	11,348 cu ft	0 cu ft	0 cu ft	0 cu ft	0 cu ft	No ACM observed	0 cu ft

6.0 DATA QUALITY ASSESSMENT

6.1 Introduction

Data used in making management decisions for decommissioning and waste management must be of adequate quality to support the decisions. Adequate data quality for decision-making is required by the Kaiser-Hill Team Quality Assurance Program (K-H, 1997, §7.1.4 and 7.2.2), as well as by the customer (DOE, RFFO; Order O 414.1, Quality Assurance, §4.b.(2)(b)). Regulators and the public also expect decisions and data that are technically and legally defensible. Verification and validation (V&V) of the data ensure that data used in decommissioning and waste management decisions are usable and defensible.

V&V of the data are the primary components of the data quality assessment (DQA). Data sets subject to V&V consist of all analytical laboratory results presented in the report. Radiological survey data are not included due to configuration changes in progress throughout the areas surveyed. The respective survey packages remain open until pre-demolition surveys are completed. The radiological survey results are adequate for characterization purposes, specifically for establishing controls for impending decommissioning work in the areas. In contrast, laboratory results are fixed within painted surfaces, and will not be affected by routine configuration changes in the areas.

This DQA on radiochemical results supports conclusions in the report by implementing QA/QC guidelines from the following MARSSIM sections:

§4.9, Quality Control;

§8.2, Data Quality Assessment;

§9.0, Quality Assurance & Quality Control;

Appendix E, Assessment Phase of the Data Life Cycle; and

Appendix N, Data Validation Using Data Descriptors

All analytical results were validated, consistent with the following RFETS-specific documents and industry guidelines:

- KH V&V Guidelines (relative to the Modules cited below)
  - ✓ Module SS03 "PCB/Pesticides"
  - ✓ Module SS05 "Inorganic Metals"
  - ✓ Module RC01 "Isotopic Determinations by Alpha Spectroscopy";
- EPA 540/R-94/013, USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review;
- EPA 540/R-94/012, USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review; and
- Lockheed-Martin, 1997. Evaluation of Radiochemical Data Usability, ES/ER/MS-5.

A summary of the radiochemical samples (by Survey Unit) is provided in Table 3-1. The DQA includes those samples listed. All radiological data are organized into survey packages, which correlate to unique Survey Units. Each survey package is systematically reviewed by the responsible Radiological Engineer, a peer reviewer, and finally, Radiological Engineering Management.

All relevant Quality records associated with the Pre-Demolition Survey (PDS) decisions will be submitted to the CERCLA Administrative Record for permanent storage within 30 days of the completion of this report. Until that time, radiological records reside with the Project's Radiological Engineer. All other Quality records reside in the Project File.

6.2 Verification and Validation of Results

Verification ensures that data produced and used by the project are documented and traceable, per quality requirements. Validation consists of a technical review of all data that directly support the PDS decisions, such that any limitations of the data relative to project goals are delineated, and the associated data are qualified (with caveats) accordingly. The V&V process was graded relative to the original DQOs of the project, as defined in Section 3.1, and specific criteria, as they pertain to PARCC parameters described below.

- Media samples (alpha spectroscopy analysis);
- Chain-of-Custody;
- Preservation and hold-times were within tolerance;
- Instrument calibrations;
- Preparation blanks;
- Interference check samples (metals);
- Matrix Spikes/Matrix Spike Duplicates (MS/MSD);
- Lab Control Samples (LCS);
- Duplicate measurements;
- Chemical yield (radiochemistry);
- Required Quantitation Limits/Minimum Detectable Activities (sensitivity of chemical and radiochemical measurements, respectively); and
- Sample analysis and preparation methods.

6.2.1 Precision

Radiochemistry (Alpha Spectroscopy)

Results from laboratory duplicates (replicates) indicate adequate reproducibility based on duplicate results within statistical tolerance values (>90% confidence of equivalency between the original sample and the duplicate).

Chemical Results

There are no significant qualifications to the TCLP metals results based on evaluation of quality criteria listed in the last section. Overall sampling precision was adequate for TCLP metals based on relative percent difference (RPD) values of less than 30%, or repeatability of results below detection limits for the combined sample pair and analyte of concern.

Although the QC data indicate poor-to-inconclusive laboratory precision for PCBs, along with inconclusive field/sampling precision, the magnitude of the PCB concentrations combined with the remainder of the laboratory QC data indicates that interior paint(s) within B771/B774 are PCB-contaminated.

Criteria for this conclusion include the following points:

1. The arithmetic mean for a sample set of paints (38 values, including QC) is 2070 ppm, which is almost 2 orders of magnitude greater than the action level of 50 ppm (only 9 of the 38 values were less than the action level).
2. Laboratory blanks showed no significant contamination that would cause enough high bias to account for the reported concentrations.
3. Laboratory control samples were generally acceptable, indicating adequate accuracy of the analytical measurements.

Qualifications to the data are also presented relative to the poor precision constituted by the field duplicates. Two of the three duplicate pairs evaluated did not fall within a typical tolerance of <20% RPD, or even 30% RPD (sometimes used as a DQO for soil sampling precision). One of the duplicate pairs showed relative agreement in that both results were well above the action level; the other duplicate pair yielded results both above and below the action level. The third duplicate pair yielded nondetected values.

Based on the data available at this time, poor laboratory precision cannot be ruled out as a contributor to the poor overall precision (vs. concluding that a true, high variability of PCB concentrations exist within the paints), because good repeatability of laboratory measurements was not demonstrated through MS/MSD results. Consider the following points:

1. Only one MS/MSD sample set was performed for the total number of 38 samples (1:38); this frequency of QC samples is well below the industry standard minimum of 1:20.

2. Of the one noted MS/MSD run, Aroclor-1260 failed due to a high bias.

In conclusion, there are matrix effects on the PCB measurements, apparently biasing the measurements high, but probably not significant enough to change the overall decision that the paints are PCB-contaminated.

6.2.2 Accuracy (and Bias)

Distance measurements recorded on maps are within 3% of actual distances based on the laser technology used for distance measurements associated with the surveys.

Radiochemistry (Alpha Spectroscopy)

Accuracy of radiochemistry results was within 20% of full-scale measurement, and about 1 pCi/g and ±1 pCi/liter for all actinides of interest, at or near contractually required minimum detectable concentrations (i.e., 0.3 pCi/g or pCi/l for 241Am and 239/240Pu; 1 pCi/g or pCi/l for the U species. These concentrations typically translate to <2 dpm/100cm^2). Sample-specific accuracies are reported on the laboratory reports as either total error (e.g., total propagated uncertainty [TPU]), or counting error. Accuracy of radiochemistry results was controlled through periodic laboratory calibrations, use of laboratory control samples (LCS), and measurement of chemical yields. Recoveries of LCS were within ±20% of the spike amount, consistent with industry standards. Other quality controls, such as sample-specific yield percentages, are maintained in the original laboratory data packages managed by K-H Analytical Services Division.

Blanks yielded no concentrations significant enough to cause a high bias in the corresponding real samples; stated differently, there are no false positive results due to cross-contamination in the laboratory.

Chemical Results

Accuracy for asbestos volumetric concentrations is based on the semi-quantitative technique of petrography via polarized light microscopy. Analysts can typically quantify components to within several percent at high concentrations ranging to ~1% at low concentrations (i.e., presence or absence of the mineral of interest). Accuracy for the project is adequate, as the contrast between 0% and 1% is a clear distinction for the decision of "ACM " vs. "No ACM."

Laboratory accuracies were generally satisfactory, based on the use of calibrated instruments, LCS, blanks, and serial dilutions. Barium and silver contamination were estimated for RIN 01N0109 due to inadequate matrix spike recoveries. Otherwise, no qualifications of the TCLP metals results were significant enough to impact project decisions (i.e., concluding that paints are not metals-contaminated).

6.2.3 Representativeness

Samples acquired for the project are representative based on the following criteria:

- Familiarity with facilities - multiple walk-downs and collaborations by management and technical staff;
- Implementation of industry-standard Chain-of-Custody protocols;
- Compliance with sample preservation and hold times; and
- Documented and (site) approved methods, particularly RSPs for scans/surveys and the following documents for alpha spectroscopy:

  IWCP Work Control No. T0104464, "Perform RLC in B774/774, includes the Collection of Paint Samples and Cores;

  SWP-771/774-00005-00, Perform Reconnaissance Level Characterization".

Radiochemistry (Alpha Spectroscopy)

All samples throughout the buildings were either paint samples (scraped from painted wall) or floor surfaces, or concrete samples, taken as a thin slice of core material. Radioactive concentrations, in pCi/g, were converted to dpm/100cm^2 for the purpose of comparing results with the unrestricted release criteria defined in DOE Order 5400.5. This conversion is conservative, as it translates all measured radioactivity to within an infinitely thin layer of the (exposed) sample surface, vs. random dispersion throughout the entire matrix of the sample. Radiochemistry samples were limited to painted and upper concrete surfaces for the purpose of representing any possible radiological contamination within anticipated "scabbled" waste streams.

Chemical

All samples throughout the buildings were paint samples scraped from painted wall or floor surfaces. Analytical samples were limited to painted surfaces for the purpose of representing any possible contaminants within "scabbled" waste streams.

6.2.4 Completeness

Sampling completeness is addressed in Table 6-1 below.

Table 6-1 Sampling & Analysis Completeness Summary

# Samples Required (incl. Media; Real & QC Samples)	# Taken (Real & QC Samples)[B]	Project Decisions (Conclusions) & Uncertainty	Comments (RIN, Analytical Method, Qualifications, etc.)
ASBESTOS			
Inspector's Discretion	255 (total) 241 reals, 14 dupes	ACM in both Buildings 771 & 774	40 CFR 763.86 5 CCR 1001-10 EPA 600/R-93/116 ("none" is <1% by volume)

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# Samples Required (incl. Media; Real & QC Samples)	# Taken (Real & QC Samples)[B]	Project Decisions (Conclusions) & Uncertainty	Comments (RIN, Analytical Method, Qualifications, etc.)
PCBs			
48 real 4 QC (dupes)	4	All paint layers represented in the B771 CAs are PCB-contaminated. All rooms and paints represented in B774, except the 771/776 tunnel & Rooms 102 & 210, are NOT PCB-contaminated	RIN 01N0109
	4		RIN 01N0077
	6		RIN 01N0108
	4		RIN 01N0110
	4		RIN 01N0116
	4		RIN 01N0117
	8		RIN 01N0118
	4		RIN 01N0125
	4		RIN 01N0126
	4		RIN 01N0133
	6		RIN 01N0134
	5		RIN 01N0135
	4		RIN 01N0144
	6		RIN 01N0145
	4		RIN 01N0146
	Total 61 real, 6 dupes		
TCLP METALS			
48 real 4 QC (dupe)	4	All paint layers represented in B771 & B774 are NOT contaminated relative to toxic metals. The paint in the exhaust tunnel may be lead-contaminated.	RIN 01N0109
	4		RIN 01N0077
	6		RIN 01N0108
	4		RIN 01N0110
	4		RIN 01N0116
	4		RIN 01N0117
	4		RIN 01N0118
	4		RIN 01N0125
	1		RIN 01N0126
	4		RIN 01N0133
	6		RIN 01N0134
	5		RIN 01N0135
	4		RIN 01N0144
	6		RIN 01N0145
	4		RIN 01N0146
	Total 61 real, 6 dupes		
RADIOCHEMCIAL SAMPLES			
15	15	Various results (see Table 4.1)	RIN 01N0035
15	15		RIN 01N0024
1	1		RIN-00N0089
1	1		RIN-01N0031
1	1		RIN-01N0031

# Samples Required (incl. Media; Real & QC Samples)	# Taken (Real & QC Samples)[B]	Project Decisions (Conclusions) & Uncertainty	Comments (RIN, Analytical Method, Qualifications, etc.)
15	15		RIN-00N0099
15	15		RIN-00N0100
15	15		RIN-00N0101
15	15		RIN-00N0102
15	15		RIN-01N0002
15	15		RIN-01N0003
17	17		RIN-00N0065
20	20		RIN-01N0066
15	15		RIN-01N0050
15	15		RIN-01N0035
15	15		RIN-01N0070
15	15		RIN-01N0058
15	15		RIN-01N0045
15	15		RIN-01N0064
30 (BIASED)	30 (BIASED)		RIN-01N0032
30 (BIASED) (7 TO DATE)	30 (BIASED) (7 TO DATE)		RIN-01N0033
5 (BIASED) (REMOVE PAINT)	5 (BIASED) (REMOVE PAINT)		RIN-01N0059
15	15		RIN-01N0005
15	15		RIN-01N0006
15	15		RIN-01N0024
15	15		RIN-01N0007
15	15		RIN-01N0022
15	15		RIN-01N0008
15	15		RIN-01N0009
15	15		RIN-01N0023
3 – BIASED	3 – BIASED		RIN-01N0073
4 – BIASED	4 – BIASED		RIN-01N0073
3 – BIASED	3 – BIASED		RIN-01N0073
10 – BIASED	10 – BIASED		RIN-01N0073

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All radiological and chemical results are valid without qualification, and form data sets with adequate quantities and quality of data for release decisions. Consistent with EPA's G-4 DQO process, the radiological sampling design was optimized by checking actual results against model output with original estimates. Use of actual sample/survey (result) variances in MARSSIM's DQO model confirms that an adequate number of samples were acquired to reach a 95% confidence in concluding contamination within the paints of a given Survey Unit.

6.2.5 Comparability

All results presented are comparable with radiological survey and analytical data on a site- and DOE-complex wide basis. This comparability is based on:

- Use of standardized engineering units in the reporting of measurement results;
- Consistent sensitivities of measurements (≤RQL or MDA);
- Use of site-approved procedures (Contract Statements of Work for laboratory analyses, §1.1);
- Systematic quality controls; and
- Thorough documentation of the planning, sampling/analysis process, and data reduction into formats designed for making decisions posed from the project's original data quality objectives.

6.2.6 Sensitivity

Adequate sensitivities in units of µg/kg (PCBs), µg/l (TCLP metals), and pCi/g were attained for all samples; these minimum detection or quantitation limits are well below the associated contaminant-specific, regulatory action levels (typically <<1/2 the action level). Sensitivity for transuranic and uranium concentrations in paint typically converted to less than 5 dpm/100cm^2, or about 5% of the $DCGL_w$. Sensitivity values are included with their associated sample results, which reside in the project file.

7.0 REFERENCES

ANSI-N323A-1997, Radiation Protection Instrumentation Test and Calibration.

DOE/RFFO, CDPHE, EPA, 1996. Rocky Flats Cleanup Agreement (RFCA), July 19, 1996.

DOE Order 5400.5, "Radiation Protection of the Public and the Environment."

DOE Order 414.1A, "Quality Assurance."

EPA, 1994. "The Data Quality Objective Process," EPA QA/G-4.

K-H, 1997. "Kaiser-Hill Team Quality Assurance Program", Rev. 5, December, 1997.

K-H, 1998. Facility Disposition Program Manual, MAN-076-FDPM, Rev. 1, September 1999.

K-H, 1999. Decontamination and Decommissioning Characterization Protocol, MAN-077-DDCP, Rev. 1, June 19, 2000.

K-H, 1999. Decommissioning Program Plan, June 21, 1999.

K-H, 2000. Pre-Demolition Survey Plan, MAN-127-PDSP, Rev. 0, October 3, 2000.

MARSSIM - Multi-Agency Radiation Survey and Site Investigation Manual, December 1997 (NUREG-1575, EPA 402-R-97-016).

RFETS, Environmental Waste Compliance Guidance #25, Management of Polychlorinated Biphenyls (PCBs) in Paint and Other Bulk Product Waste During Facility Disposition.

RFETS, Environmental Waste Compliance Guidance #27, Lead-Based Paint (LBP) and Lead-Based Paint Debris Disposal.

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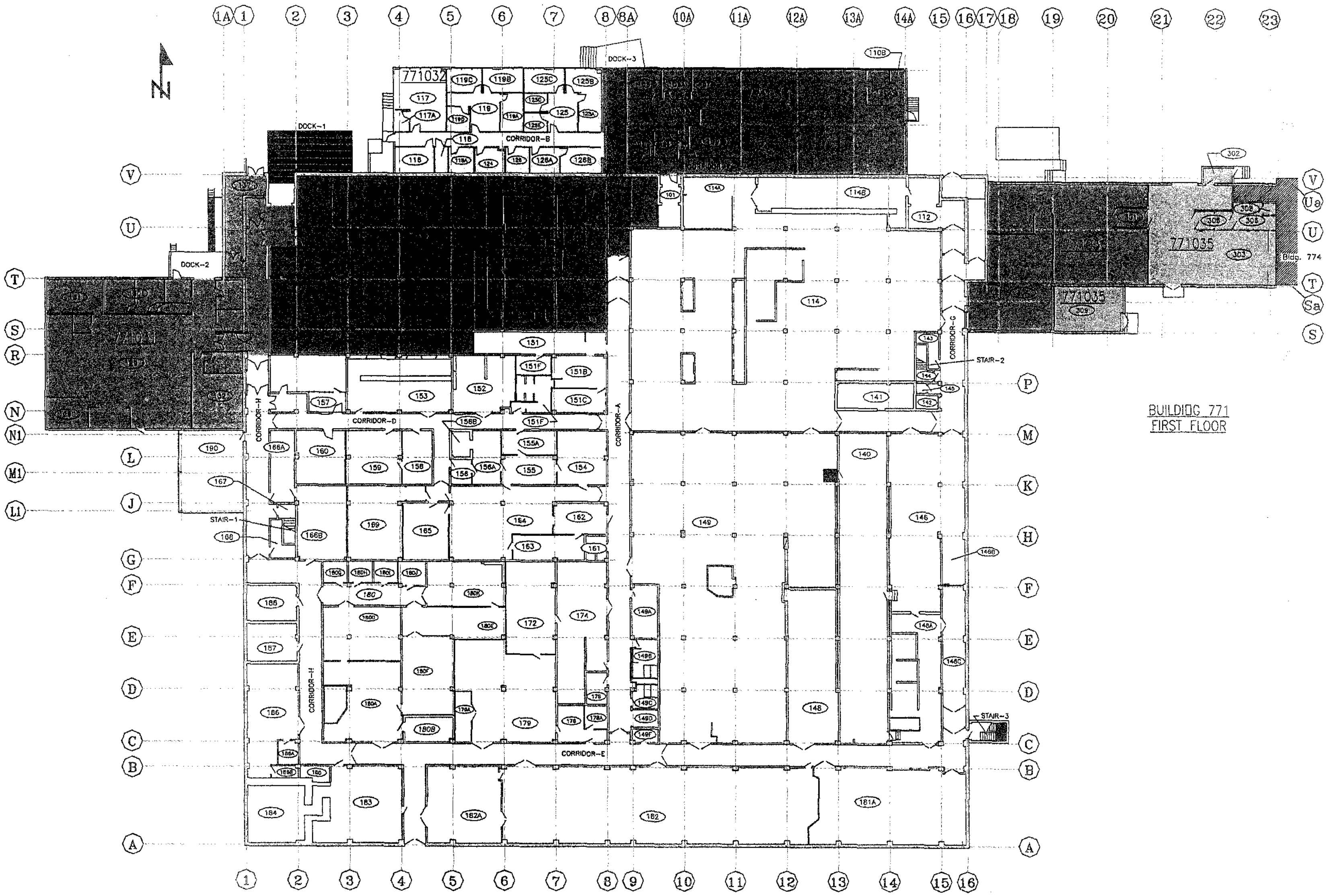
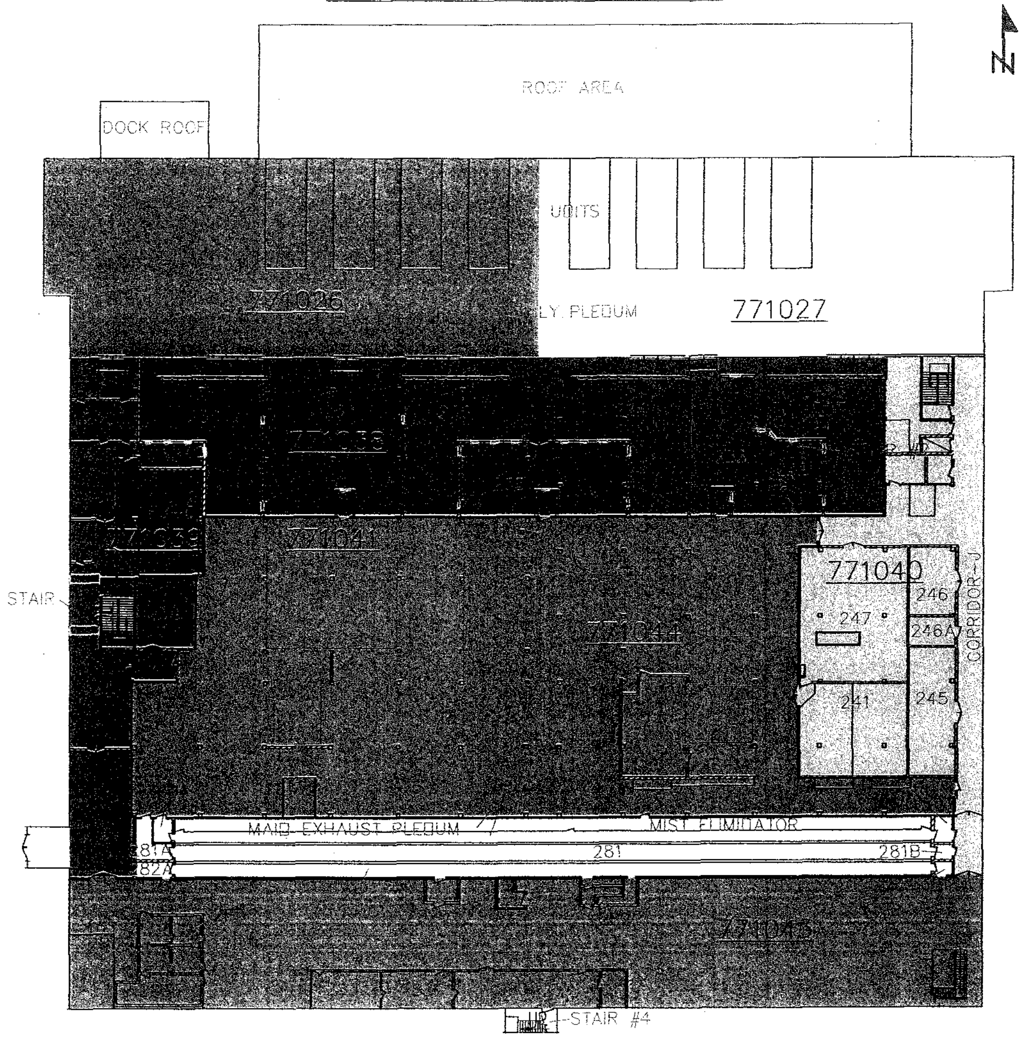
ATTACHMENT A

Locations of Radiological Survey Units

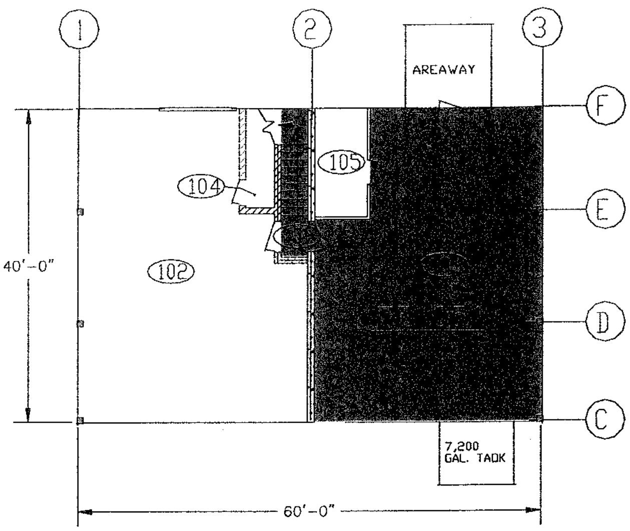


BUILDIOG 771
FIRST FLOOR

BUILDI□G 771 SECO□D FLOOR



(65)

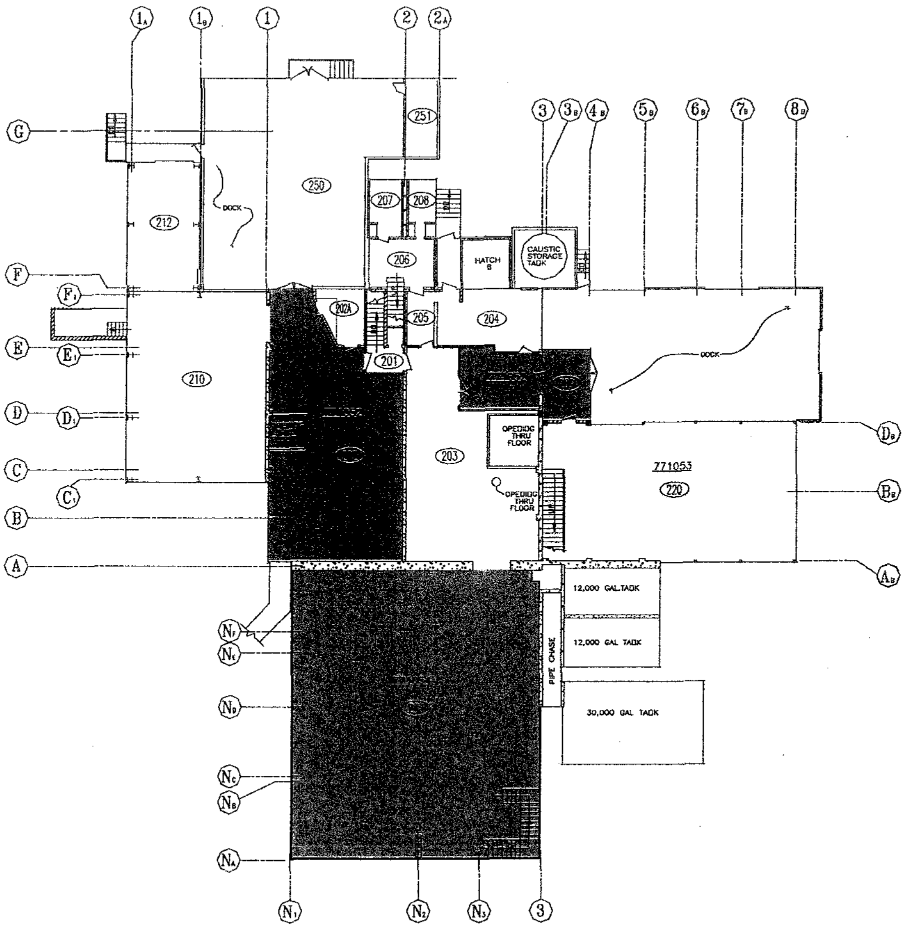


BUILDIDG 774

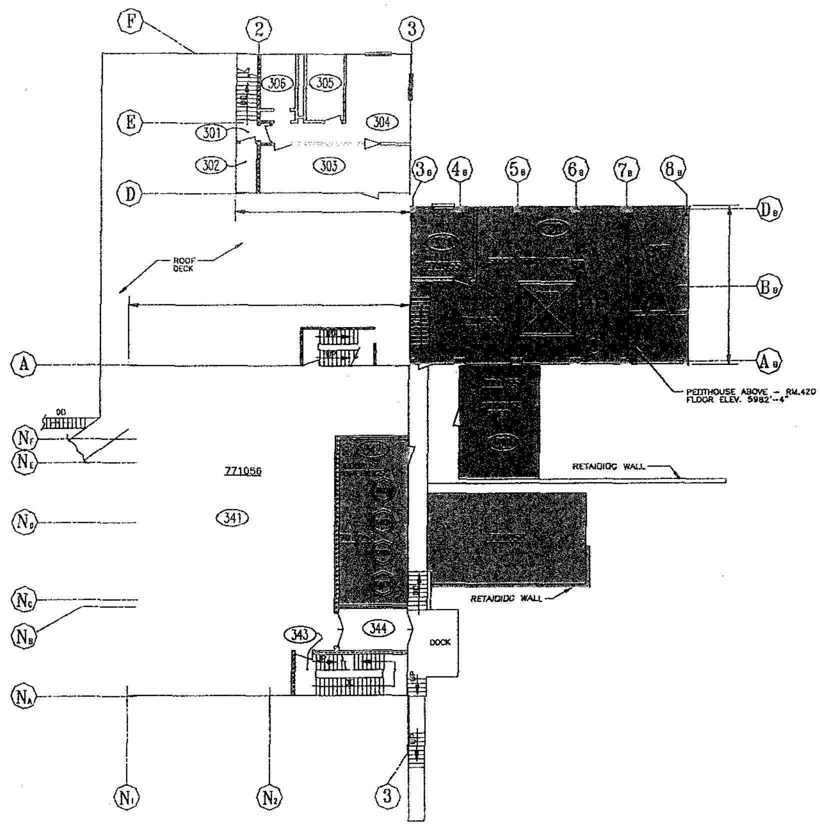
FIRST FLODR PLAD

ELEVATIDD 5940'-0"

66

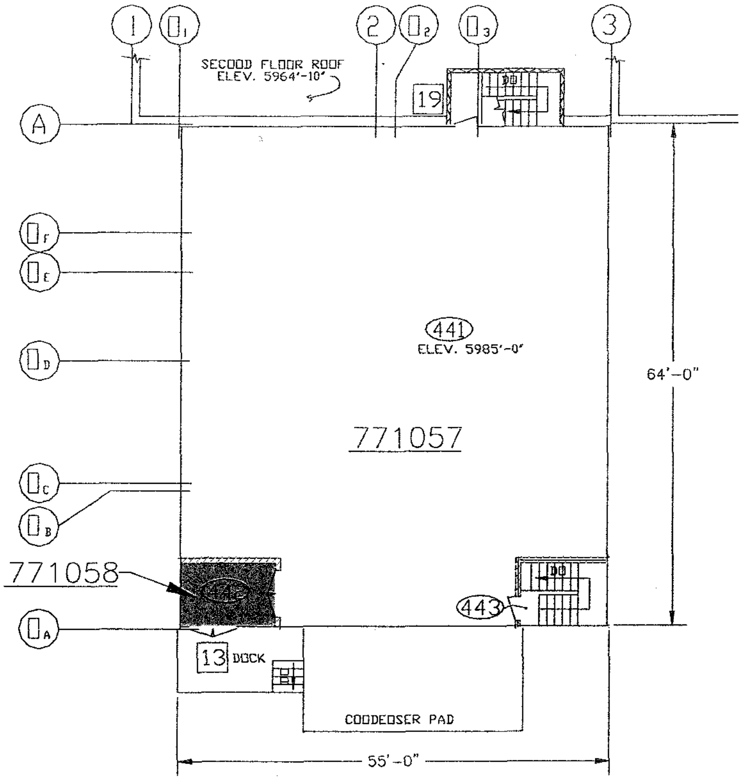


BUILDING 774
SECOND FLOOR PLAN



BUILDING 774
THIRD FLOOR PLAN

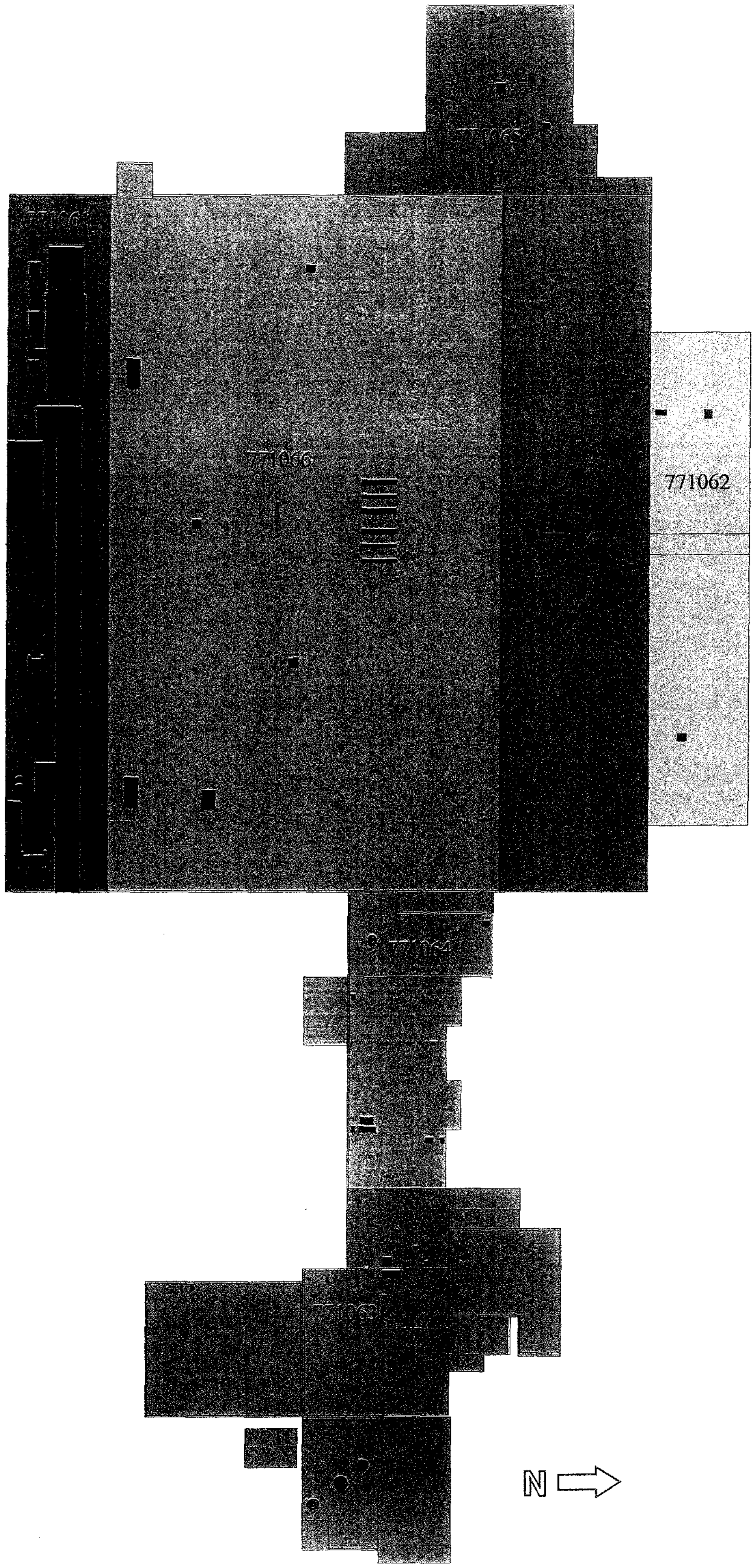
68



BUILDING 774

FOURTH FLOOR PLAN

Building 771/774 Roof Overview



ATTACHMENT B

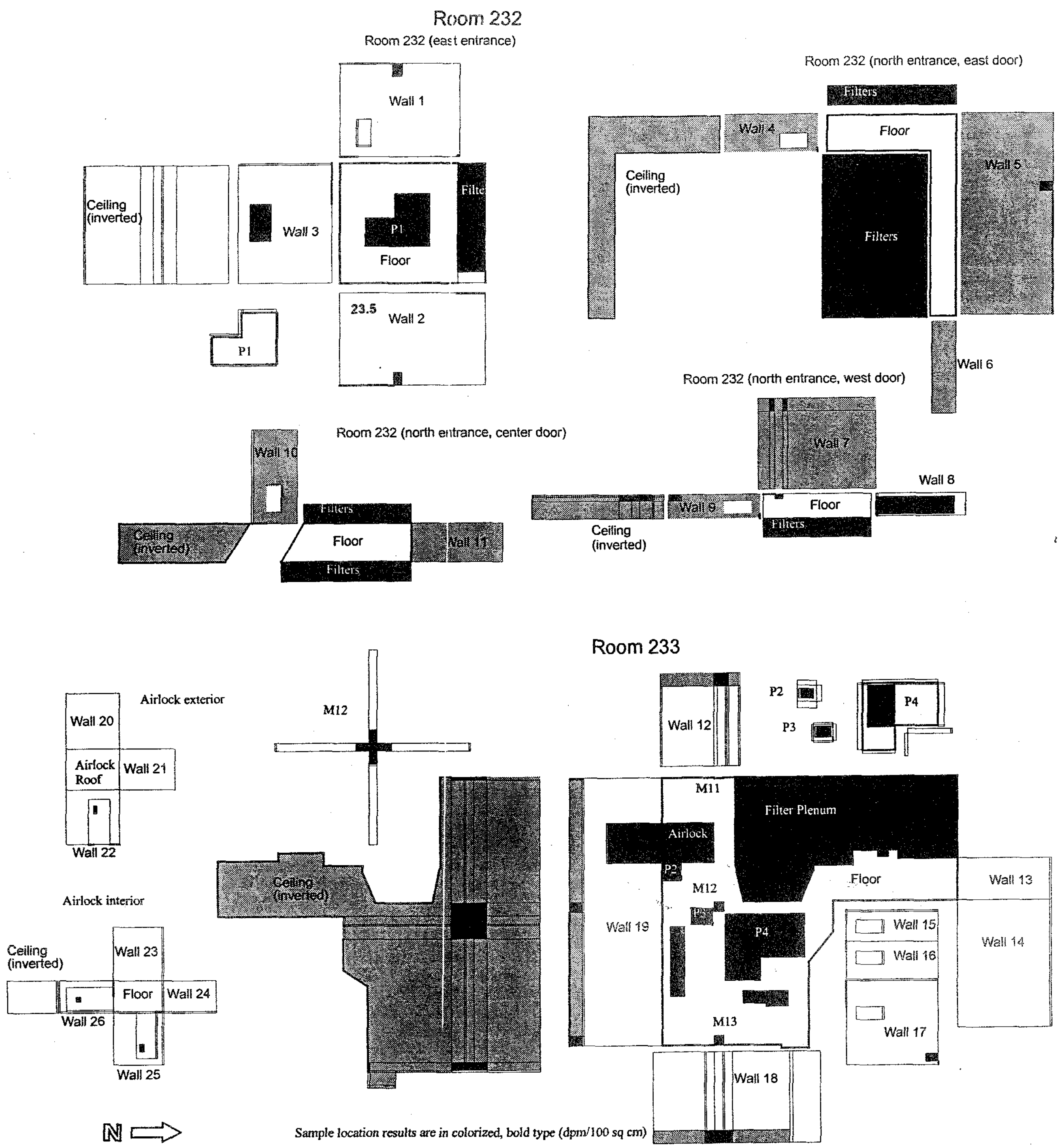
Radiological Posting Plots
by 771/774 Survey Unit

RADIOLOGICAL CLOSEOUT SURVEY FOR THE 771 CLUSTER

Survey Area: AH   Survey Unit: 771038   Classification: 2
Building: 771
Survey Unit Description: Rooms 232-238, 236A

Total Floor Area: 779 sq. m   Total Area: 3229 sq. m   Grid Size: N/A

SURVEY UNIT 771038 - MAP 1 OF 5



N ⇨

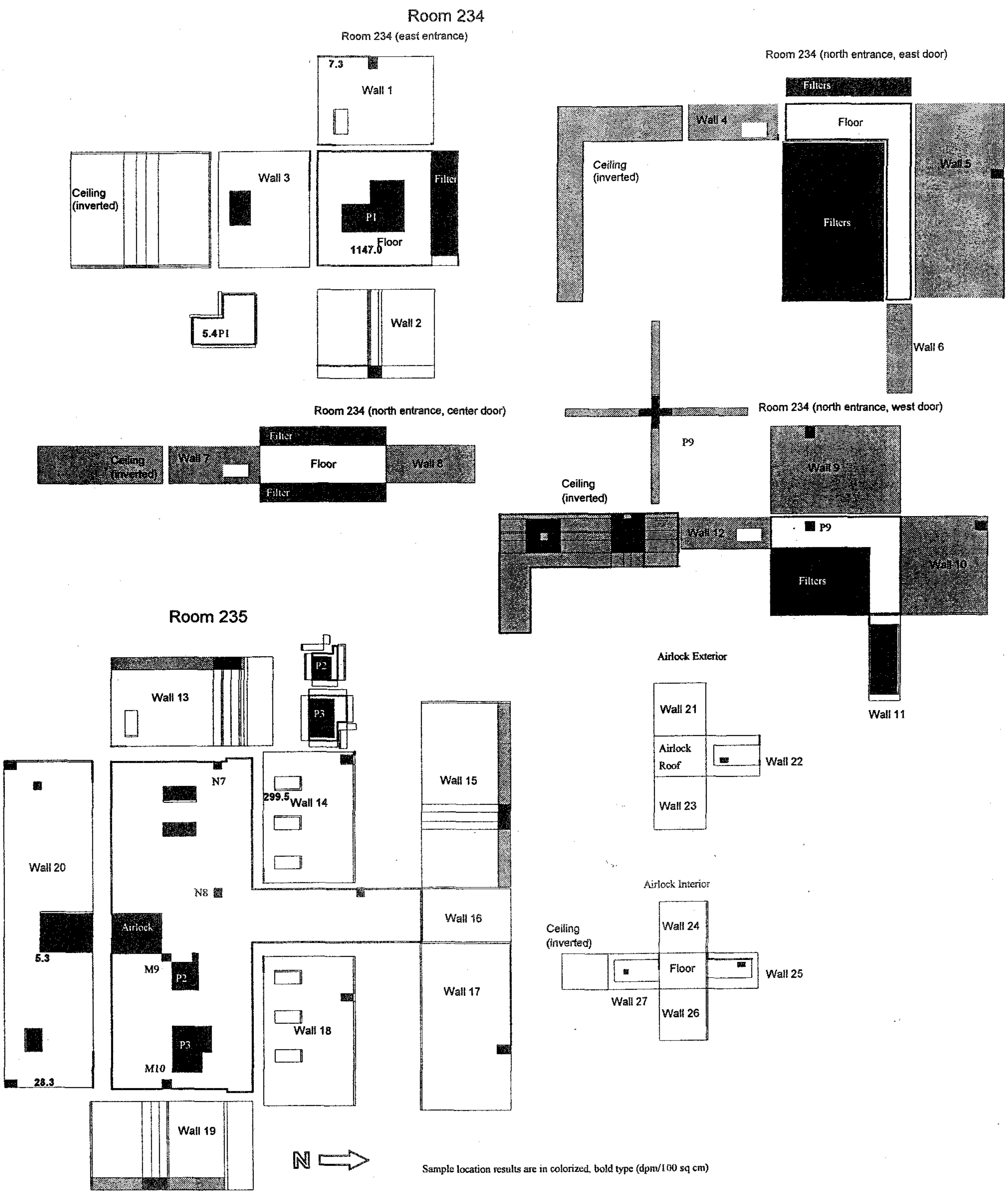
Sample location results are in colorized, bold type (dpm/100 sq cm)

RADIOLOGICAL CLOSEOUT SURVEY FOR THE 771 CLUSTER

Survey Area: AH　　Survey Unit: 771038　　Classification: 2
Building: 771
Survey Unit Description: Rooms 232-238, 238A

Total Floor Area: 779 sq. m　　Total Area: 3229 sq. m　　Grid Size: N/A

SURVEY UNIT 771038 - MAP 2 OF 5



Sample location results are in colorized, bold type (dpm/100 sq cm)

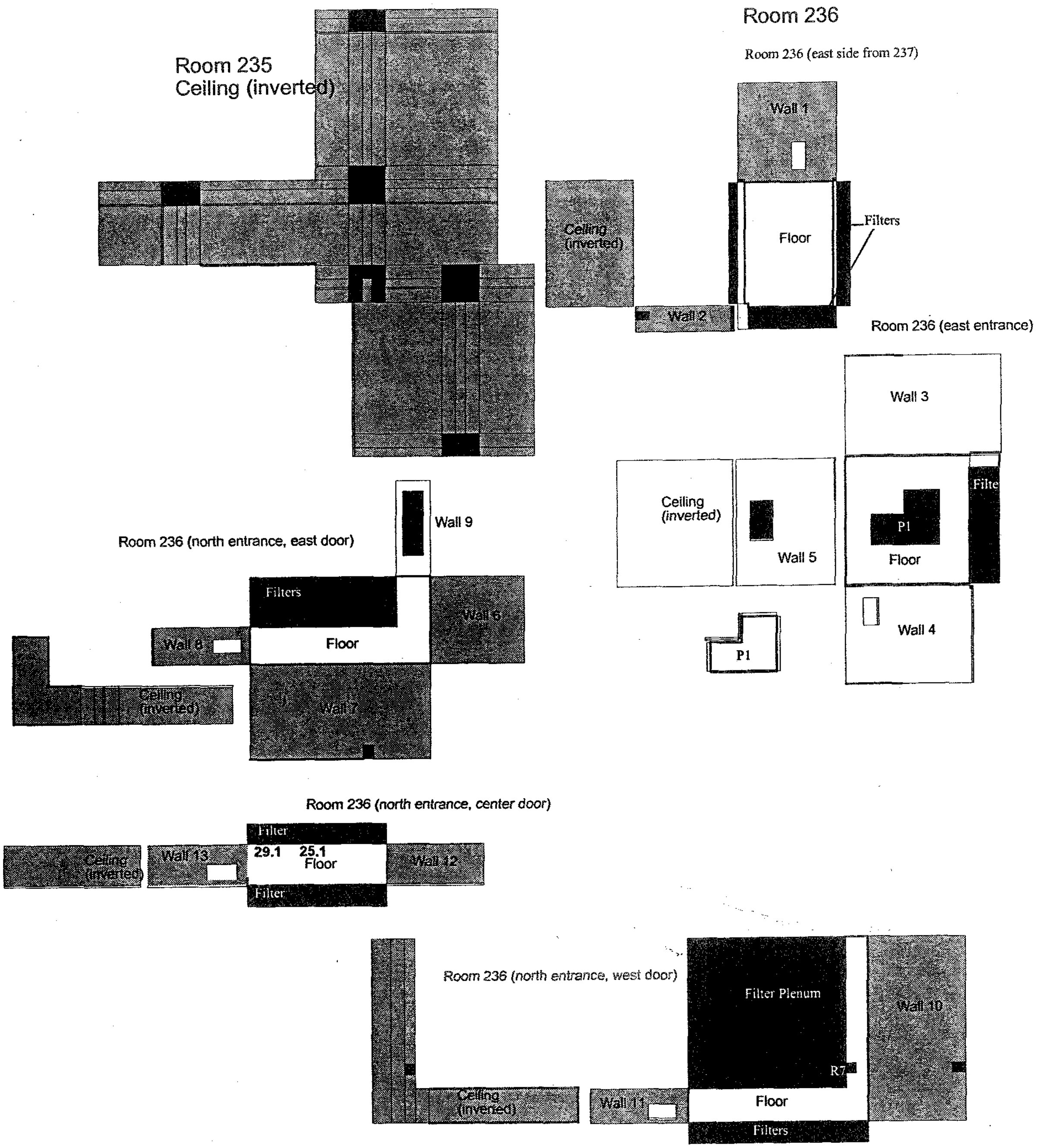
73

RADIOLOGICAL CLOSEOUT SURVEY FOR THE 771 CLUSTER

Survey Area: AH Survey Unit: 771038 Classification: 2
Building: 771
Survey Unit Description: Rooms 232-238, 238A

Total Floor Area: 779 sq. m Total Area: 3229 sq. m Grid Size: N/A

SURVEY UNIT 771038 - MAP 3 OF 5



N ⇨

Sample location results are in colorized, bold type (dpm/100 sq cm)

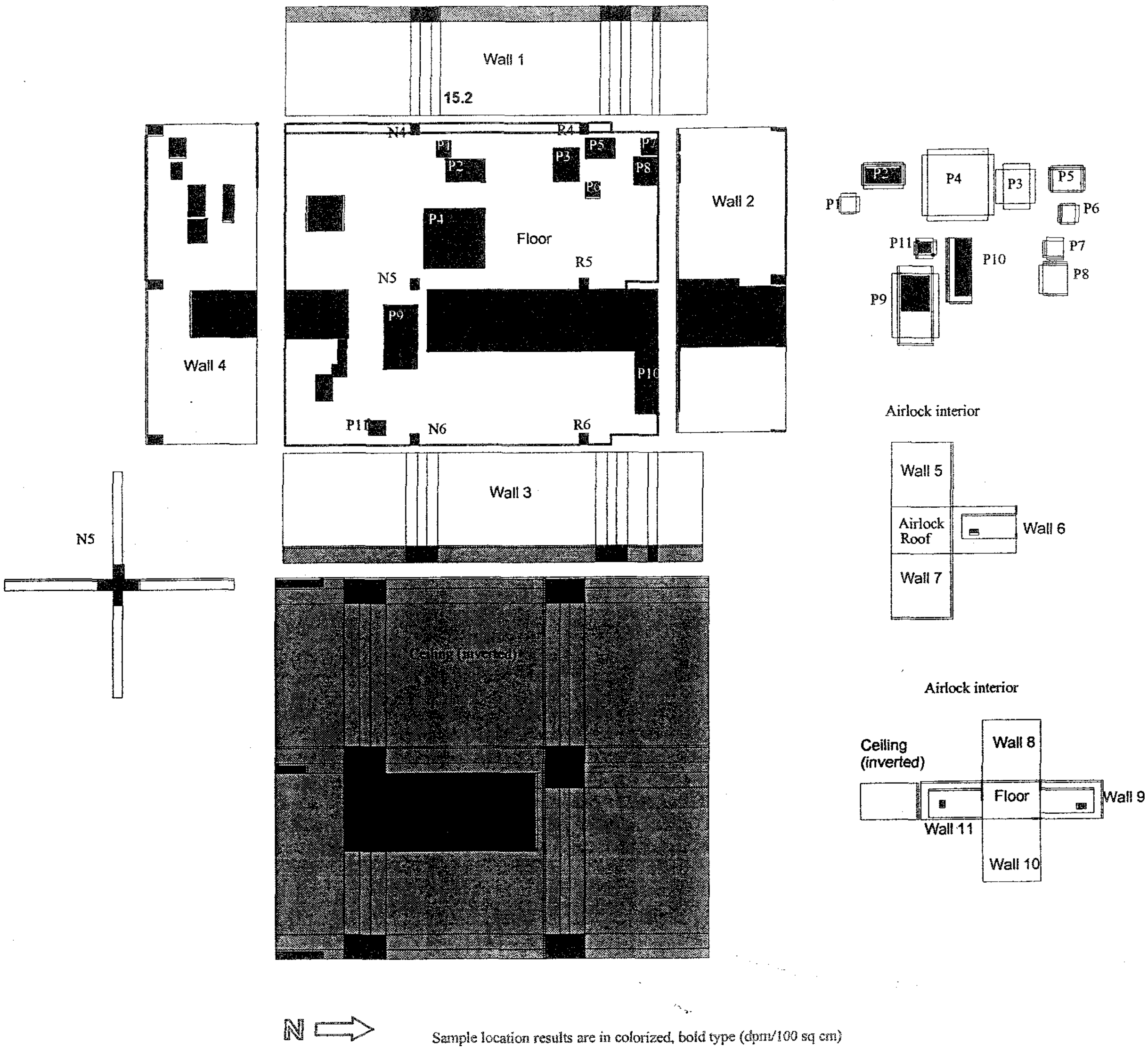
RADIOLOGICAL CLOSEOUT SURVEY FOR THE 771 CLUSTER

Survey Area: AH **Survey Unit:** 771038 **Classification:** 2
Building: 771
Survey Unit Description: Rooms 232-238, 238A

Total Floor Area: 779 sq. m Total Area: 3229 sq. m Grid Size: N/A

SURVEY UNIT 771038 - MAP 4 OF 5

Room 237



Sample location results are in colorized, bold type (dpm/100 sq cm)

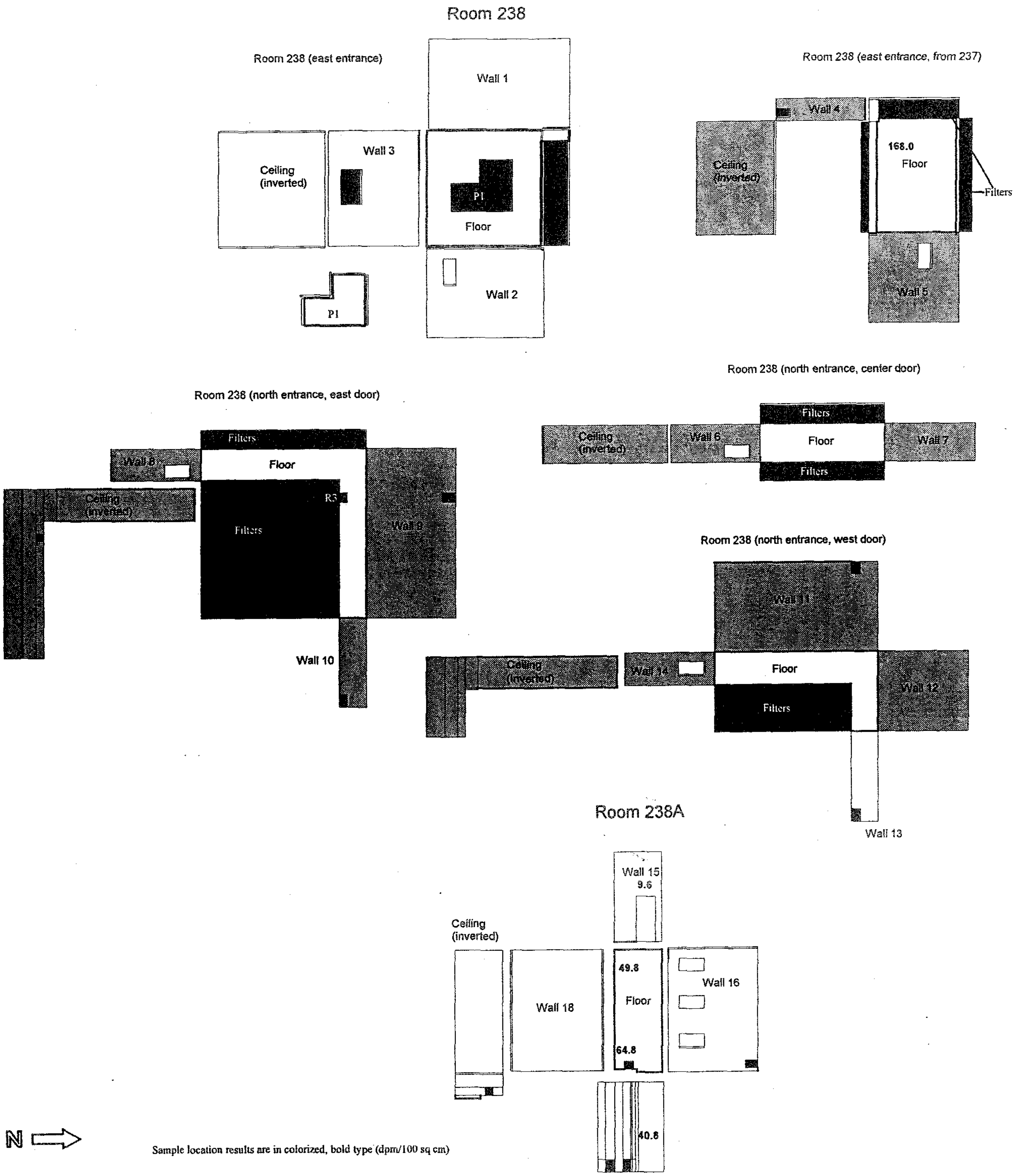
75

RADIOLOGICAL CLOSEOUT SURVEY FOR THE 771 CLUSTER

Survey Area: AH **Survey Unit:** 771038 **Classification:** 2
Building: 771
Survey Unit Description: Rooms 232-238, 238A

Total Floor Area: 779 sq. m **Total Area:** 3229 sq. m **Grid Size:** N/A

SURVEY UNIT 771038 - MAP 5 OF 5



N

Sample location results are in colorized, bold type (dpm/100 sq cm)

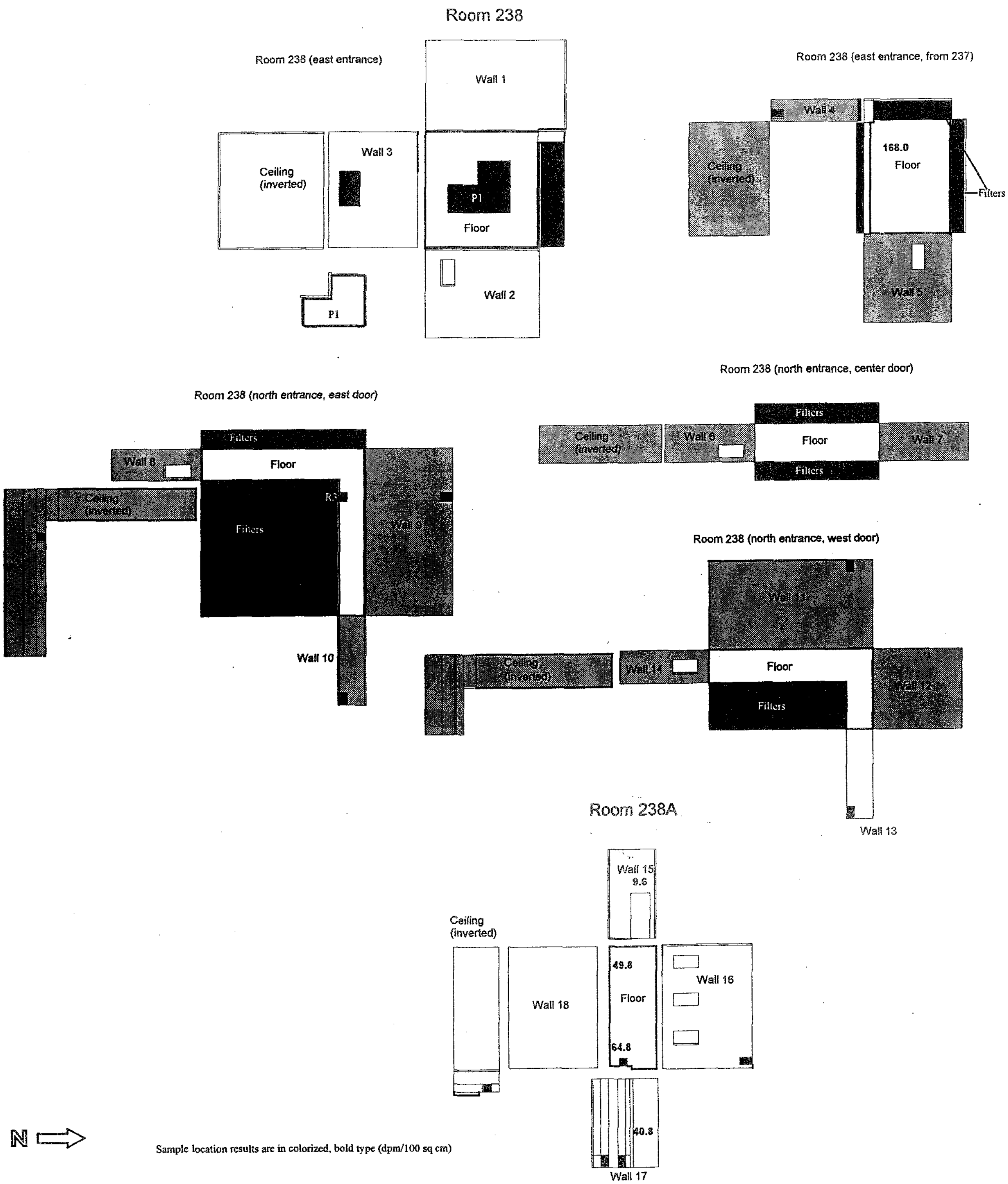
76

RADIOLOGICAL CLOSEOUT SURVEY FOR THE 771 CLUSTER

Survey Area: AH Survey Unit: 771038 Classification: 2
Building: 771
Survey Unit Description: Rooms 232-238, 238A

Total Floor Area: 779 sq. m Total Area: 3229 sq. m Grid Size: N/A

SURVEY UNIT 771038 - MAP 5 OF 5



Sample location results are in colorized, bold type (dpm/100 sq cm)

77

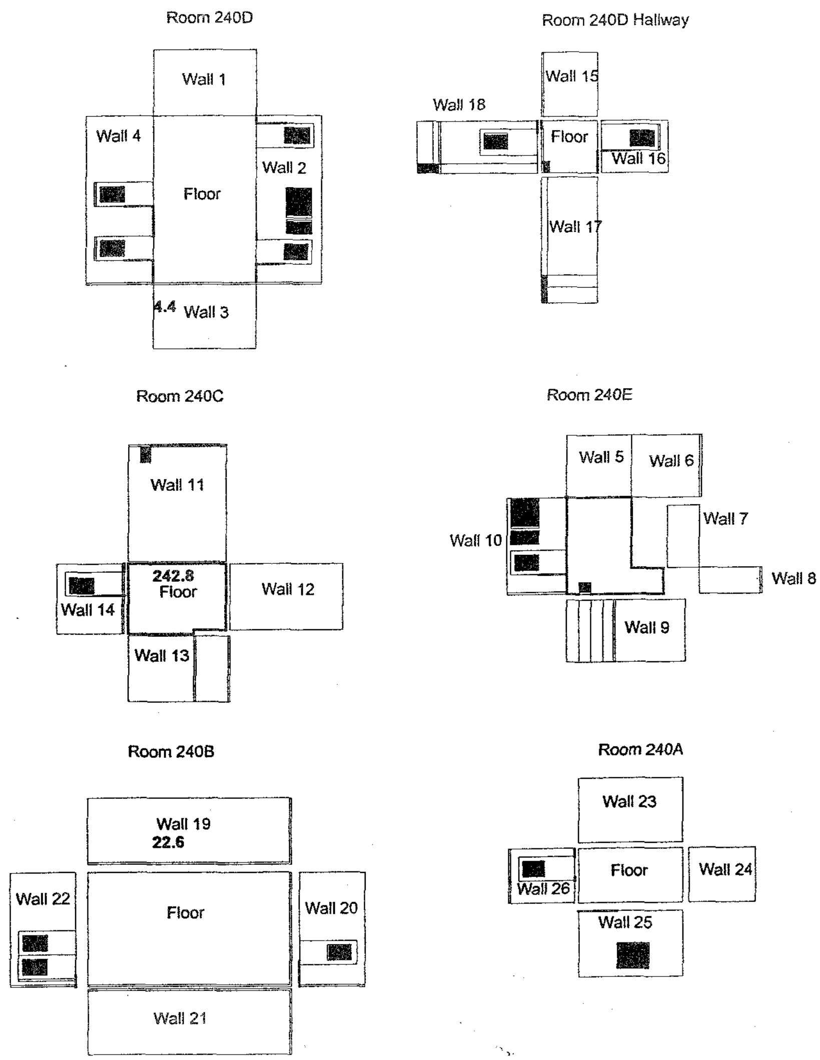
RADIOLOGICAL CLOSEOUT SURVEY FOR THE 771 CLUSTER

Survey Area: AH **Survey Unit:** 771039 **Classification:** 2
Building: 771
Survey Unit Description: Rooms 239, 240, 240A-G

Total Floor Area: 301 sq. m **Total Area:** 1595 sq. m **Grid Size:** N/A

SURVEY UNIT 771039 - MAP 1 OF 3

771



N

Sample location results are in colorized, bold type (dpm/100 sq cm)

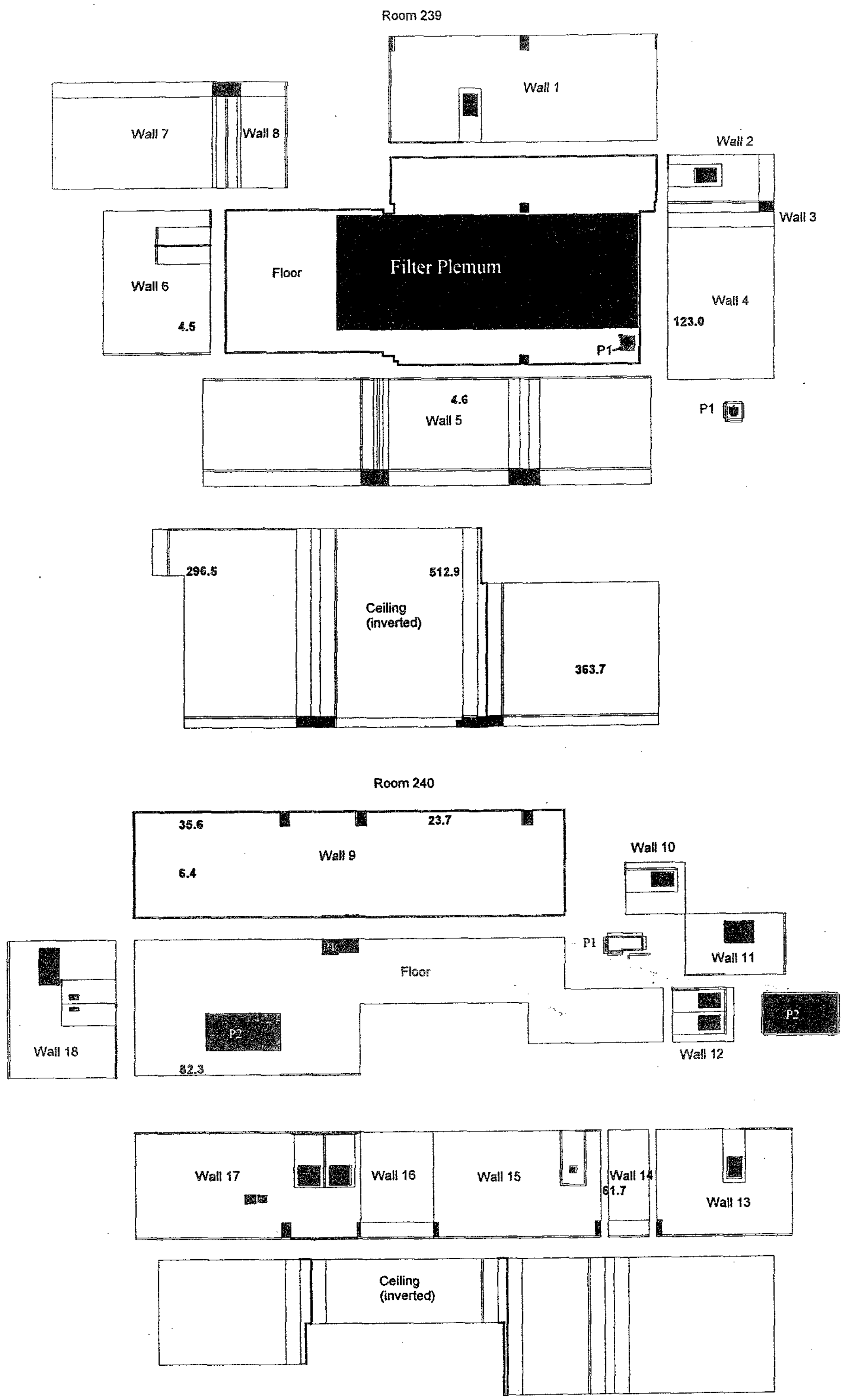
RADIOLOGICAL CLOSEOUT SURVEY FOR THE 771 CLUSTER

Survey Area: AH Survey Unit: 771039 Classification: 2
Building: 771
Survey Unit Description: Rooms 239, 240, 240A-G

Total Floor Area: 301 sq. m Total Area: 1595 sq. m Grid Size: N/A

SURVEY UNIT 771039 - MAP 2 OF 3

771



N ⇨

Sample location results are in colorized, bold type (dpm/100 sq cm)

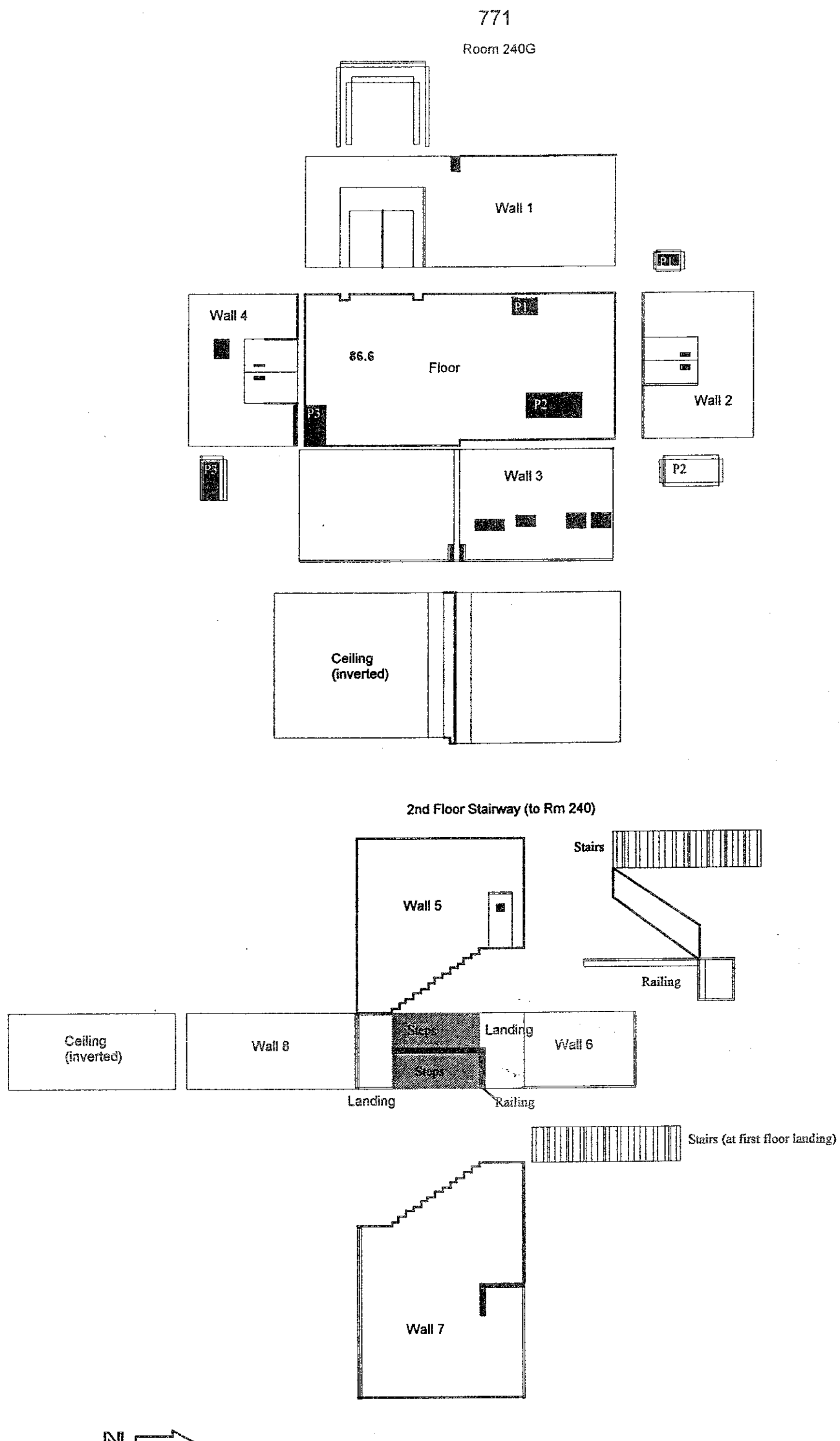
79

RADIOLOGICAL CLOSEOUT SURVEY FOR THE 771 CLUSTER

Survey Area: AH Survey Unit: 771039 Classification: 2
Building: 771
Survey Unit Description: Rooms 239, 240, 240A-G

Total Floor Area: 301 sq. m Total Area: 1595 sq. m Grid Size: N/A

SURVEY UNIT 771039 - MAP 3 OF 3



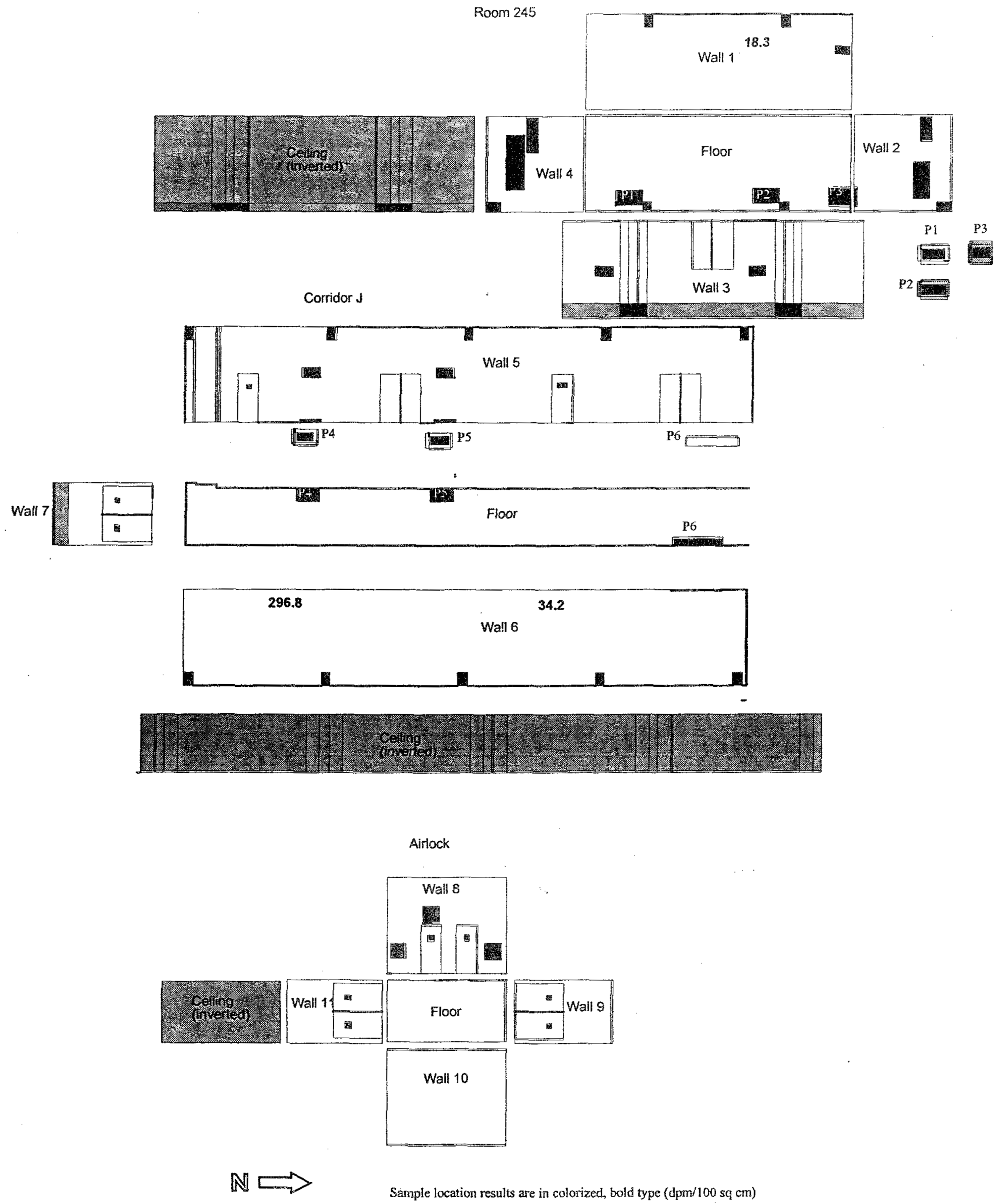
Sample location results are in colorized, bold type (dpm/100 sq cm)

RADIOLOGICAL CLOSEOUT SURVEY FOR THE 771 CLUSTER

Survey Area: AH **Survey Unit: 771040** **Classification: 2**
Building: 771
Survey Unit Description: Rooms 229-231, 241, 245-247, Corridor J

Total Floor Area: 503 sq. m **Total Area: 2342 sq. m** **Grid Size: N/A**

SURVEY UNIT 771040 - MAP 1 OF 4



Sample location results are in colorized, bold type (dpm/100 sq cm)

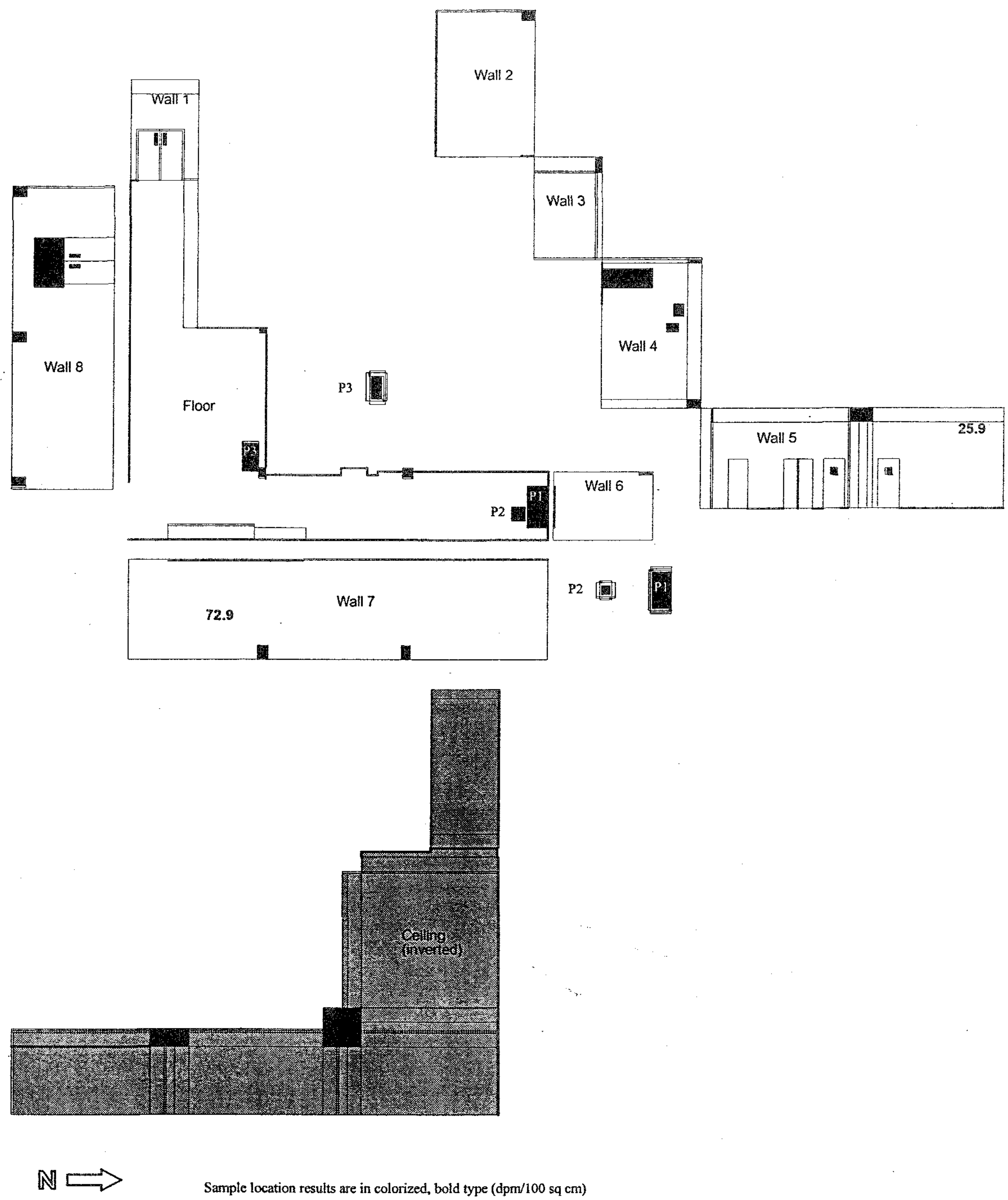
81

RADIOLOGICAL CLOSEOUT SURVEY FOR THE 771 CLUSTER

Survey Area: AH **Survey Unit:** 771040 **Classification:** 2
Building: 771
Survey Unit Description: Rooms 229-231, 241, 245-247, Corridor J

Total Floor Area: 503 sq. m **Total Area:** 2342 sq. m **Grid Size:** N/A

SURVEY UNIT 771040 - MAP 2 OF 4



Sample location results are in colorized, bold type (dpm/100 sq cm)

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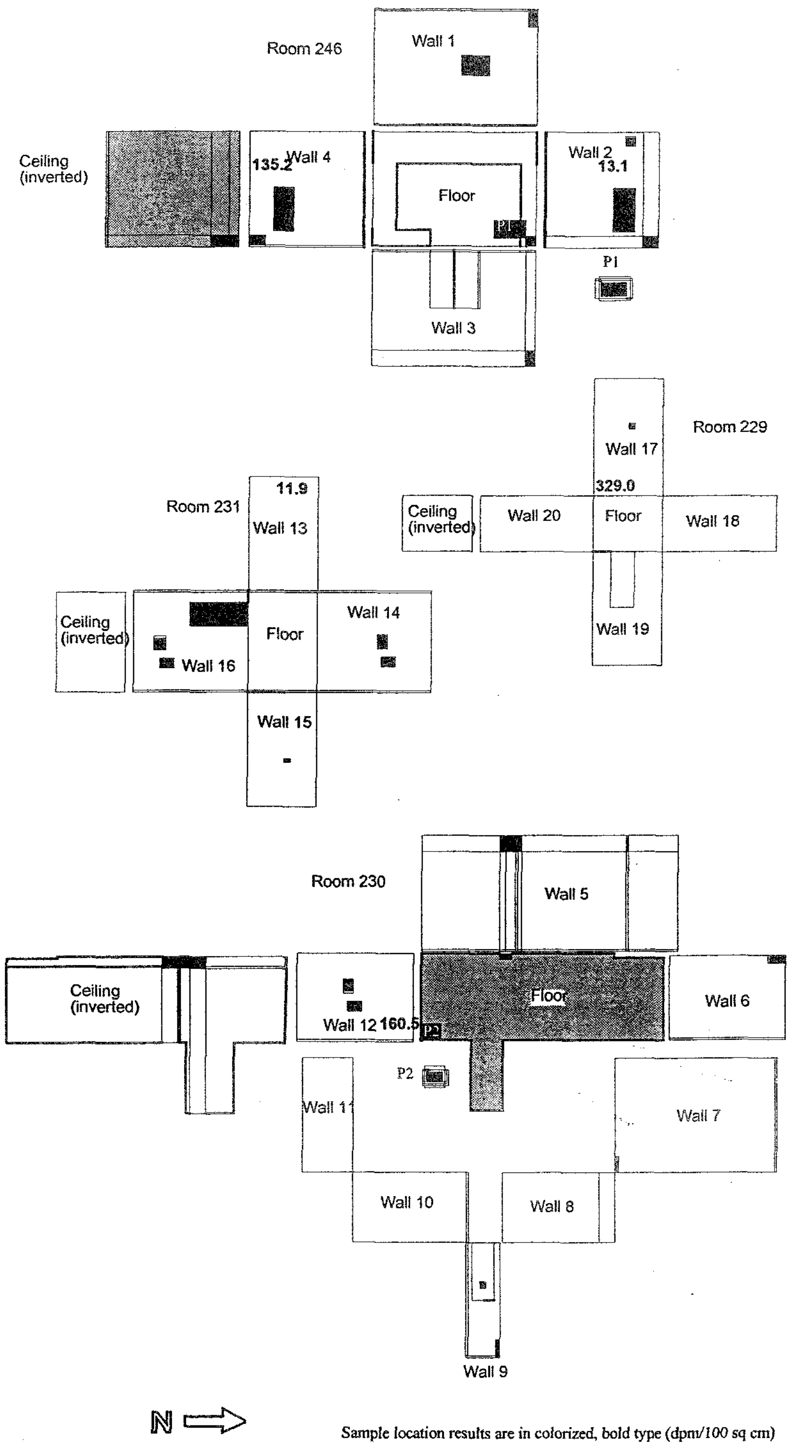
RADIOLOGICAL CLOSEOUT SURVEY FOR THE 771 CLUSTER

Survey Area: AH **Survey Unit:** 771040 **Classification:** 2
Building: 771
Survey Unit Description: Rooms 229-231, 241, 245-247, Corridor J

Total Floor Area: 503 sq. m **Total Area:** 2342 sq. m **Grid Size:** N/A

SURVEY UNIT 771040 - MAP 3 OF 4



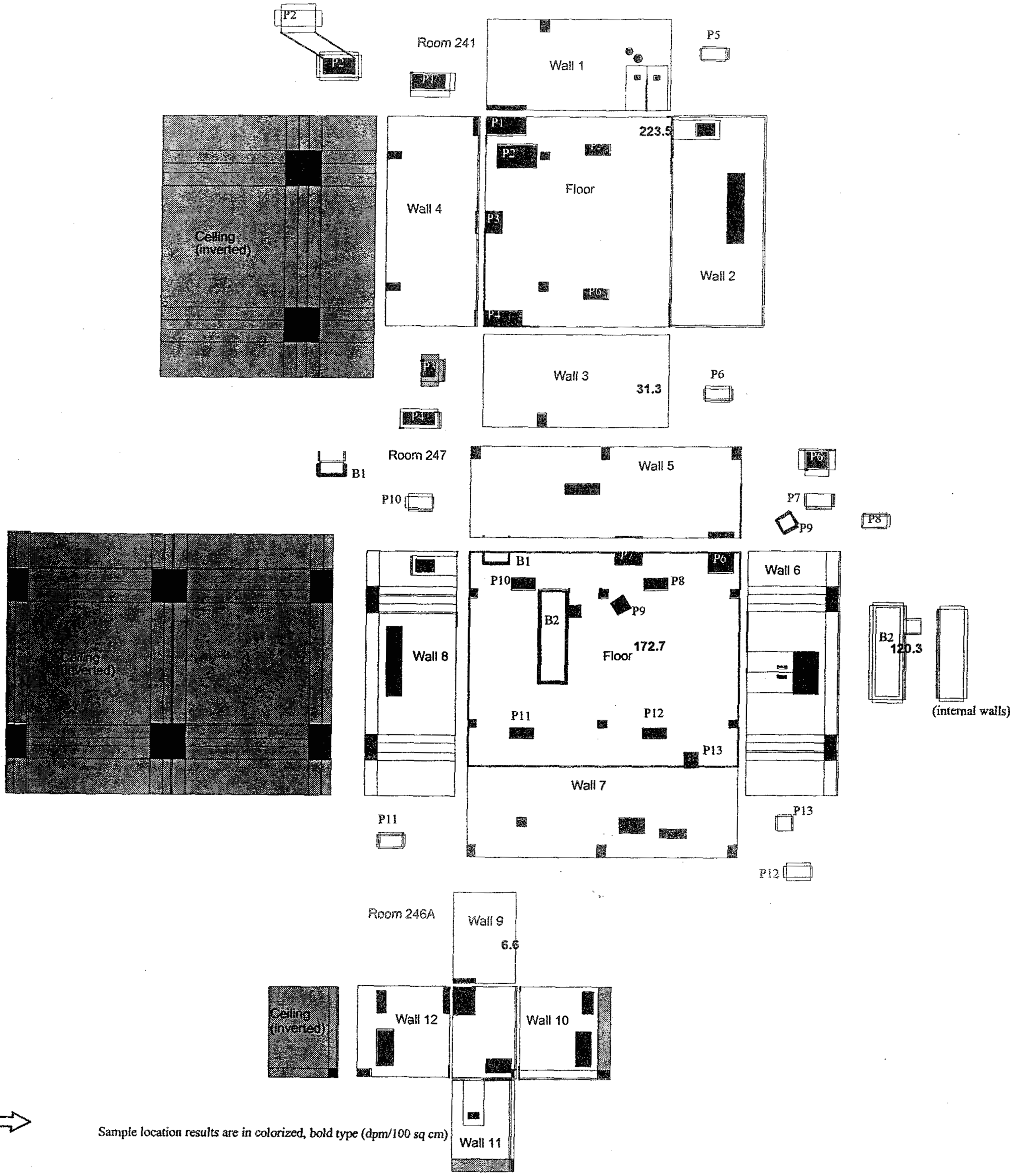
Sample location results are in colorized, bold type (dpm/100 sq cm)

RADIOLOGICAL CLOSEOUT SURVEY FOR THE 771 CLUSTER

Survey Area: AH　　Survey Unit: 771040　　Classification: 2
Building: 771
Survey Unit Description: Rooms 229-231, 241, 245-247, Corridor J

Total Floor Area: 503 sq. m　　Total Area: 2342 sq. m　　Grid Size: N/A

SURVEY UNIT 771040 - MAP 4 OF 4



N ⇨

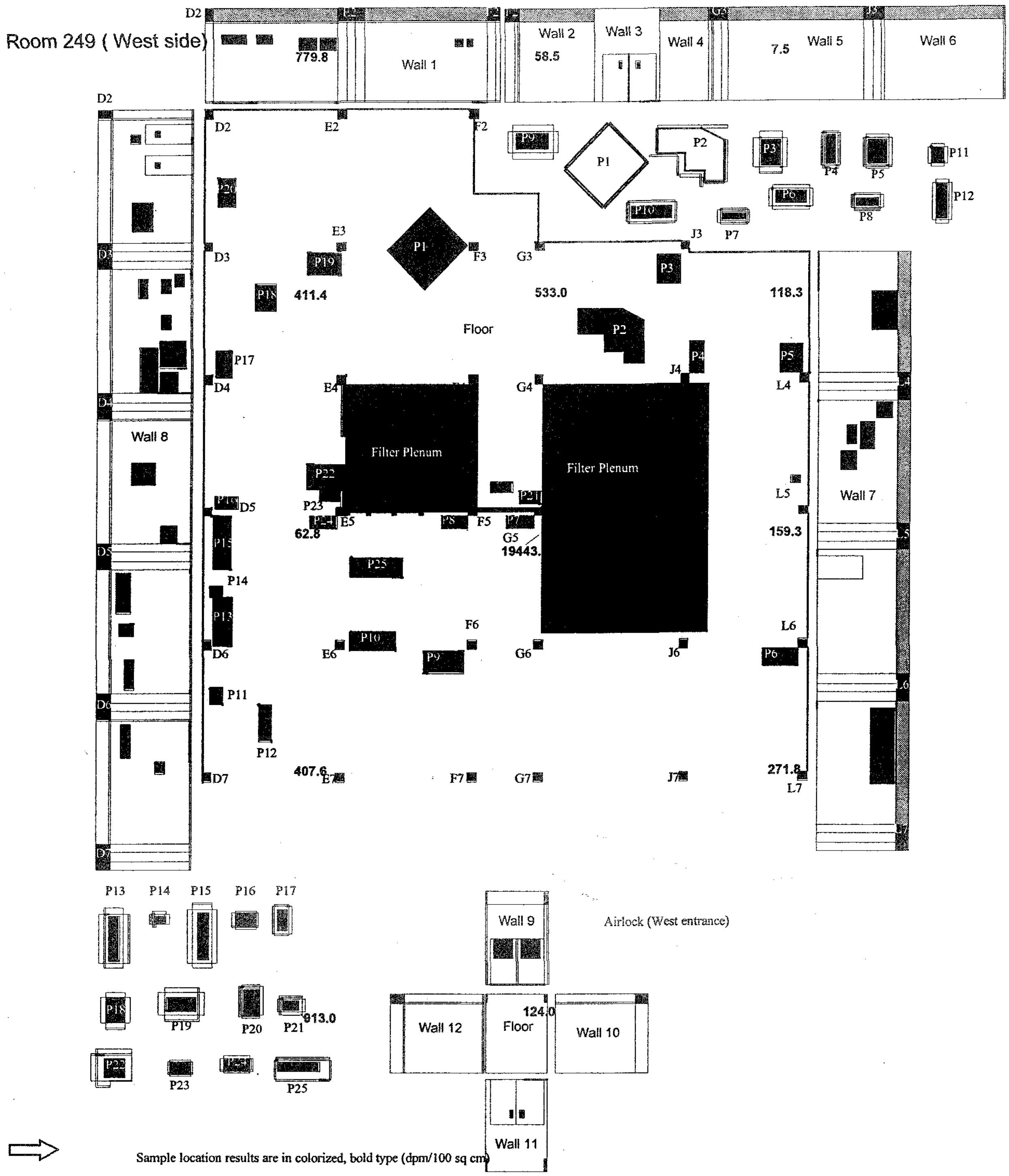
Sample location results are in colorized, bold type (dpm/100 sq cm)

RADIOLOGICAL CLOSEOUT SURVEY FOR THE 771 CLUSTER

Survey Area: AH **Survey Unit: 771041** **Classification: 2**
Building: 771
Survey Unit Description: Room 249

Total Floor Area: 597 sq. m **Total Area: 2024 sq. m** **Grid Size: N/A**

SURVEY UNIT 771041 - MAP 1 OF 3



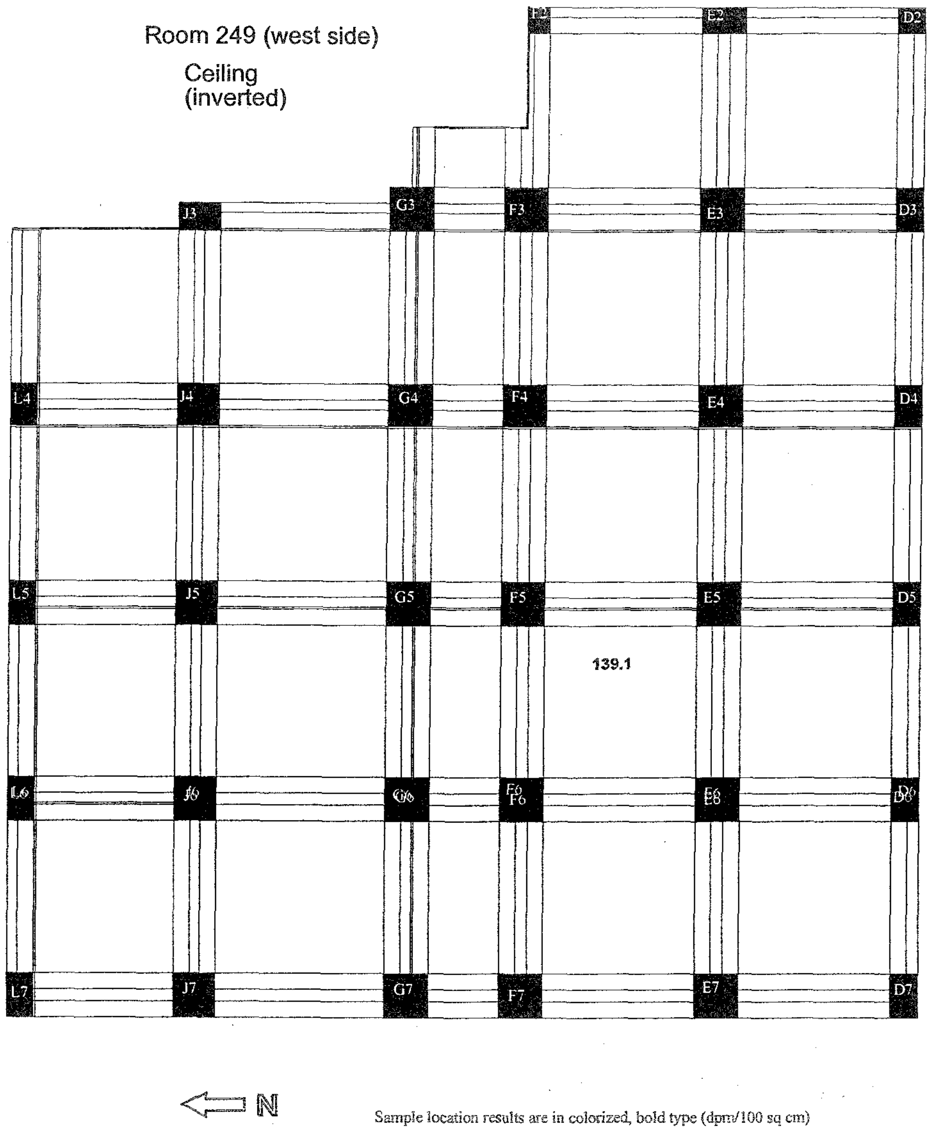
Sample location results are in colorized, bold type (dpm/100 sq cm)

RADIOLOGICAL CLOSEOUT SURVEY FOR THE 771 CLUSTER

Survey Area: AH **Survey Unit: 771041** **Classification: 2**
Building: 771
Survey Unit Description: Room 249

Total Floor Area: 597 sq. m **Total Area: 2024 sq. m** **Grid Size: N/A**

SURVEY UNIT 771041 - MAP 2 OF 3



Sample location results are in colorized, bold type (dpm/100 sq cm)

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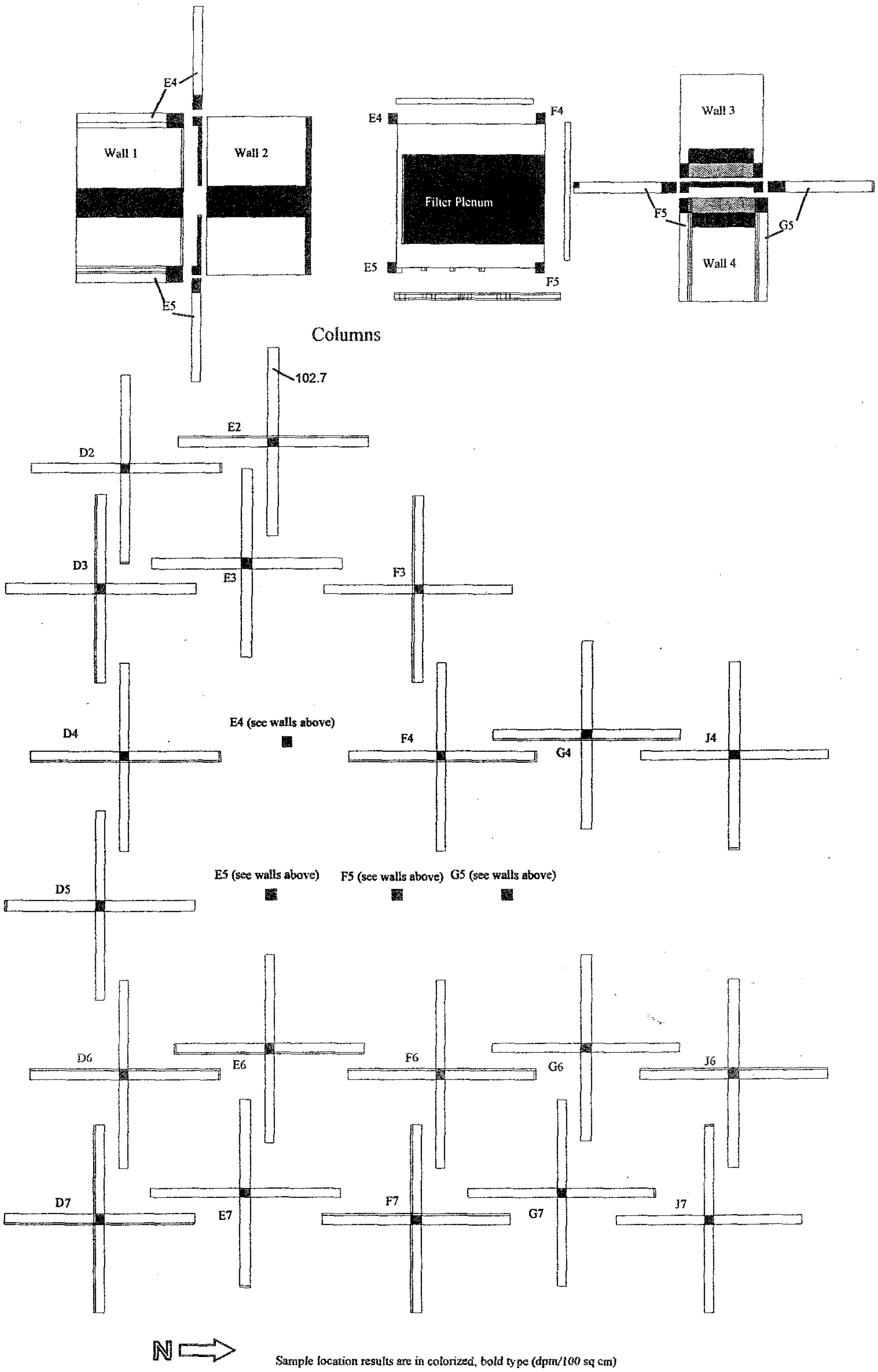
RADIOLOGICAL CLOSEOUT SURVEY FOR THE 771 CLUSTER

Survey Area: AH Survey Unit: 771041 Classification: 2
Building: 771
Survey Unit Description: Room 249

Total Floor Area: 597 sq. m Total Area: 2024 sq. m Grid Size: N/A

SURVEY UNIT 771041 - MAP 3 OF 3



Sample location results are in colorized, bold type (dpm/100 sq cm)

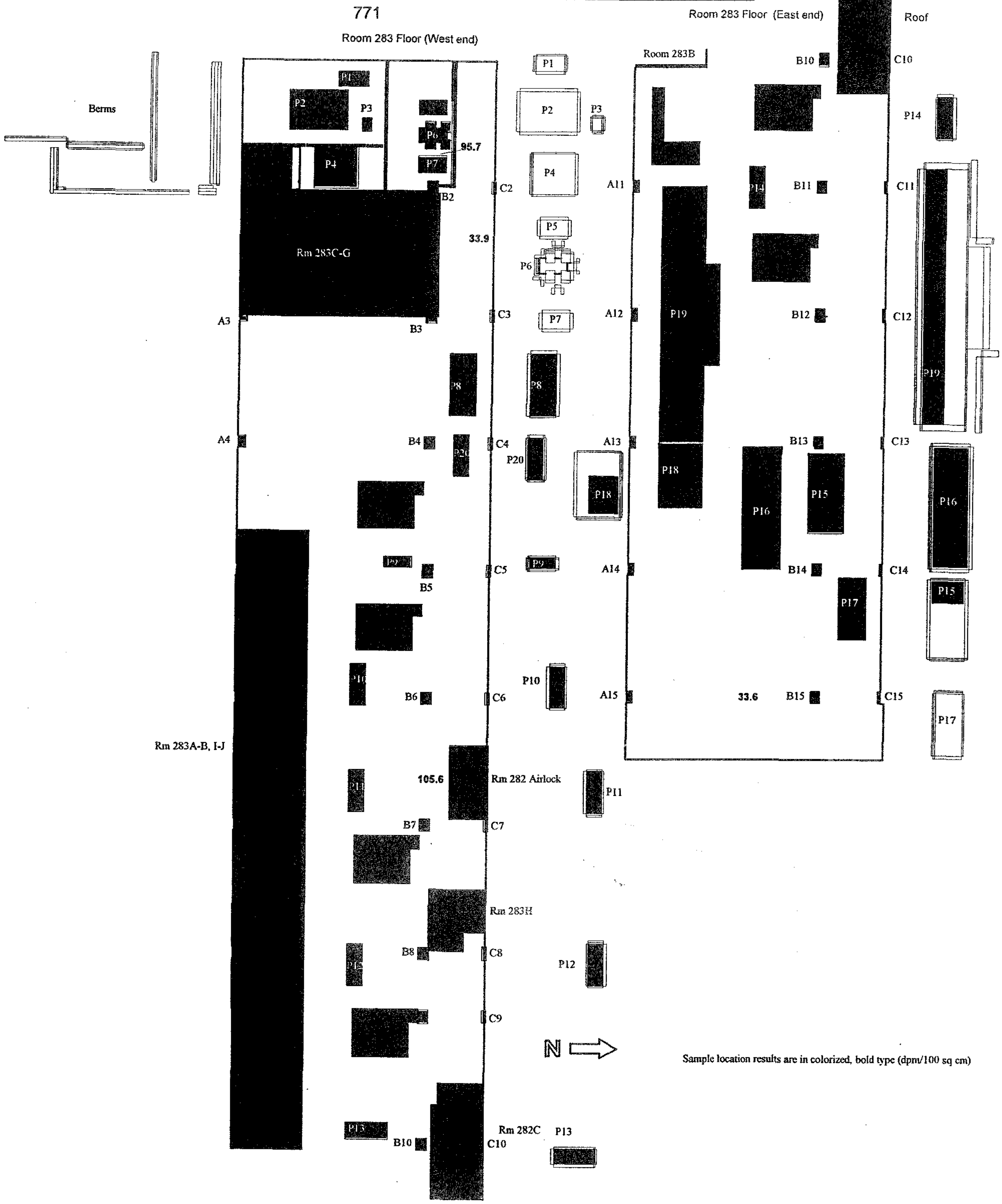
87

RADIOLOGICAL CLOSEOUT SURVEY FOR THE 771 CLUSTER

Survey Area: AH Survey Unit: 771043 Classification: 2
Building: 771
Survey Unit Description: Rooms 283, 283A-J

Total Floor Area: 870 sq. m Total Area: 4633 sq. m Grid Size: N/A

SURVEY UNIT 771043 - MAP 1 OF 6



Sample location results are in colorized, bold type (dpm/100 sq cm)

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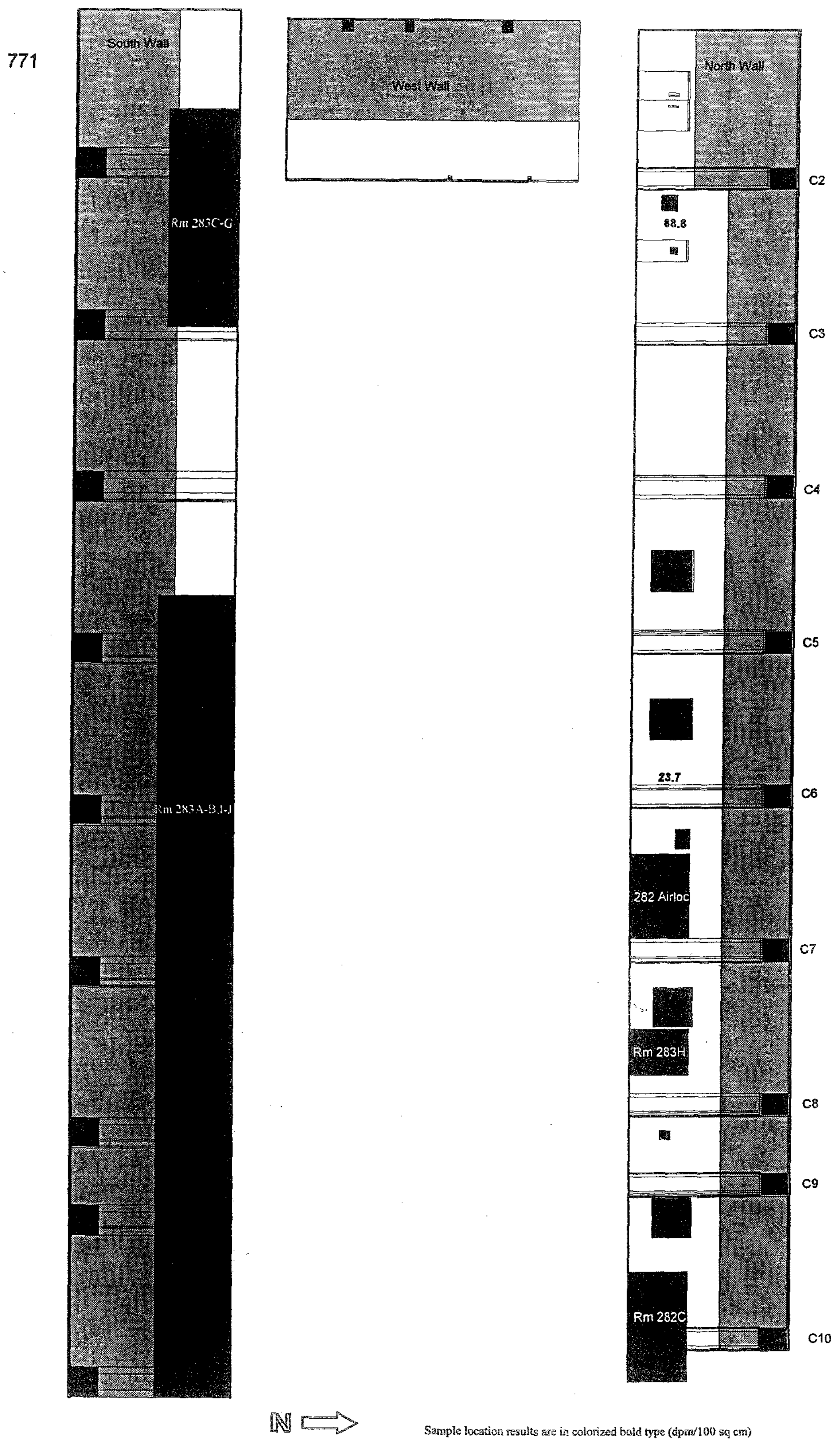
RADIOLOGICAL CLOSEOUT SURVEY FOR THE 771 CLUSTER

Survey Area: AH   Survey Unit: 771043   Classification: 2
Building: 771
Survey Unit Description: Rooms 283, 283A-J

Total Floor Area: 870 sq. m   Total Area: 4633 sq. m   Grid Size: N/A

SURVEY UNIT 771043 - MAP 2 OF 6



Sample location results are in colorized bold type (dpm/100 sq cm)

RADIOLOGICAL CLOSEOUT SURVEY FOR THE 771 CLUSTER

Survey Area: AH   Survey Unit: 771043   Classification: 2
Building: 771
Survey Unit Description: Rooms 283, 283 A-J

Total Floor Area: 870 sq. m   Total Area: 4633 sq. m   Grid Size: N/A

SURVEY UNIT 771043 - MAP 3 OF 6

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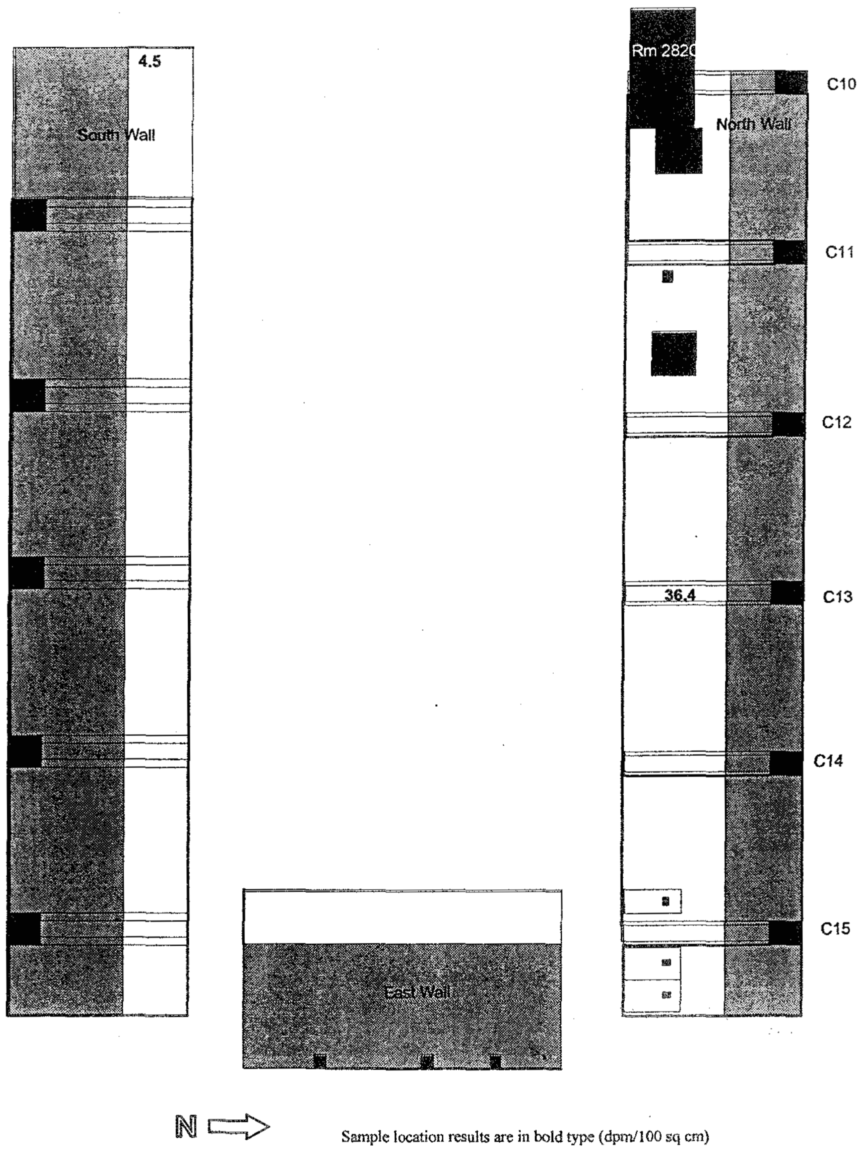


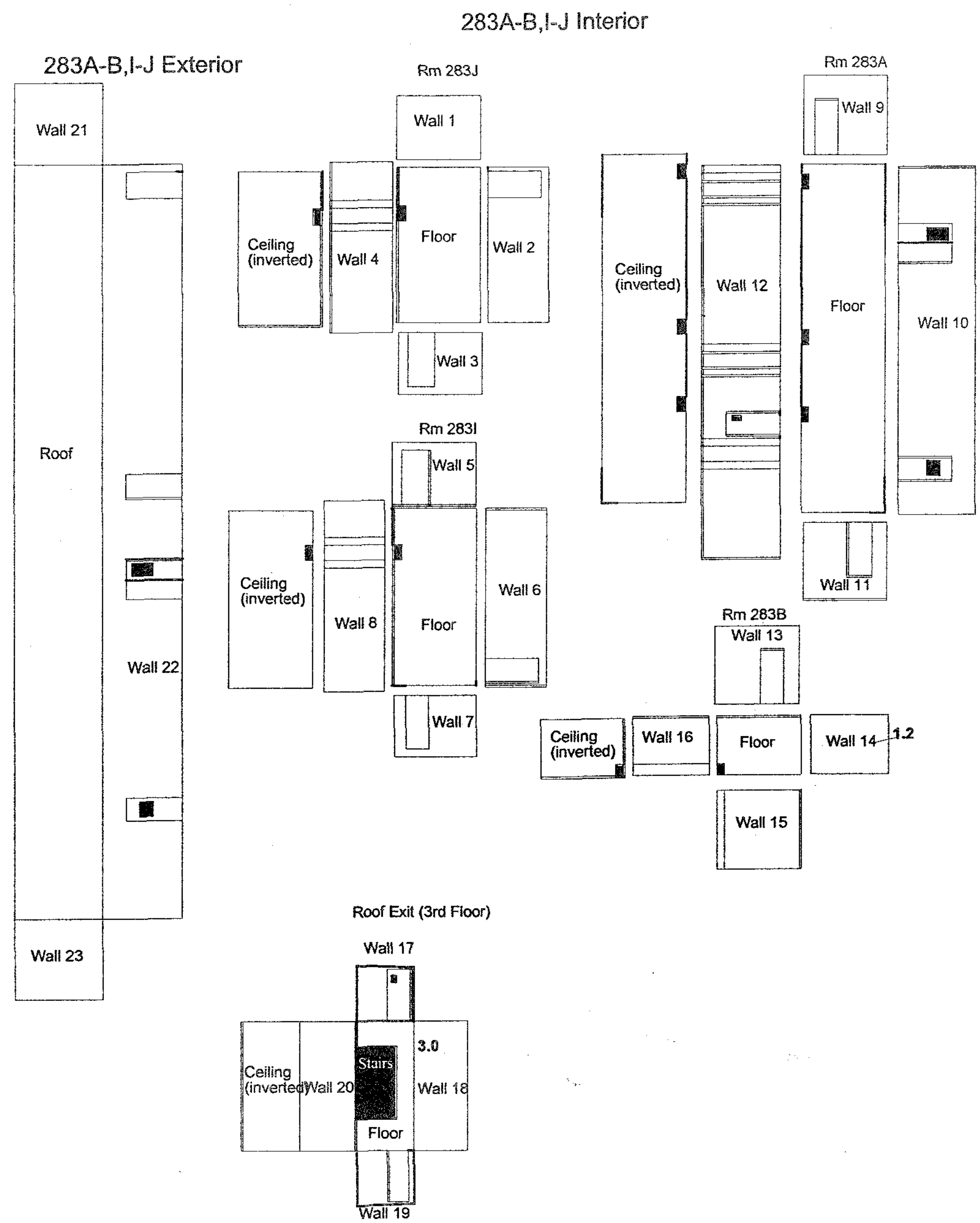
Sample location results are in bold type (dpm/100 sq cm)

RADIOLOGICAL CLOSEOUT SURVEY FOR THE 771 CLUSTER

Survey Area: AH   Survey Unit: 771043   Classification: 2
Building: 771
Survey Unit Description: Rooms 283, 283A-J

Total Floor Area: 670 sq. m   Total Area: 4633 sq. m   Grid Size: N/A

SURVEY UNIT 771043 - MAP 4 OF 6



Sample location results are in colorized, bold type (dpm/100 sq cm)

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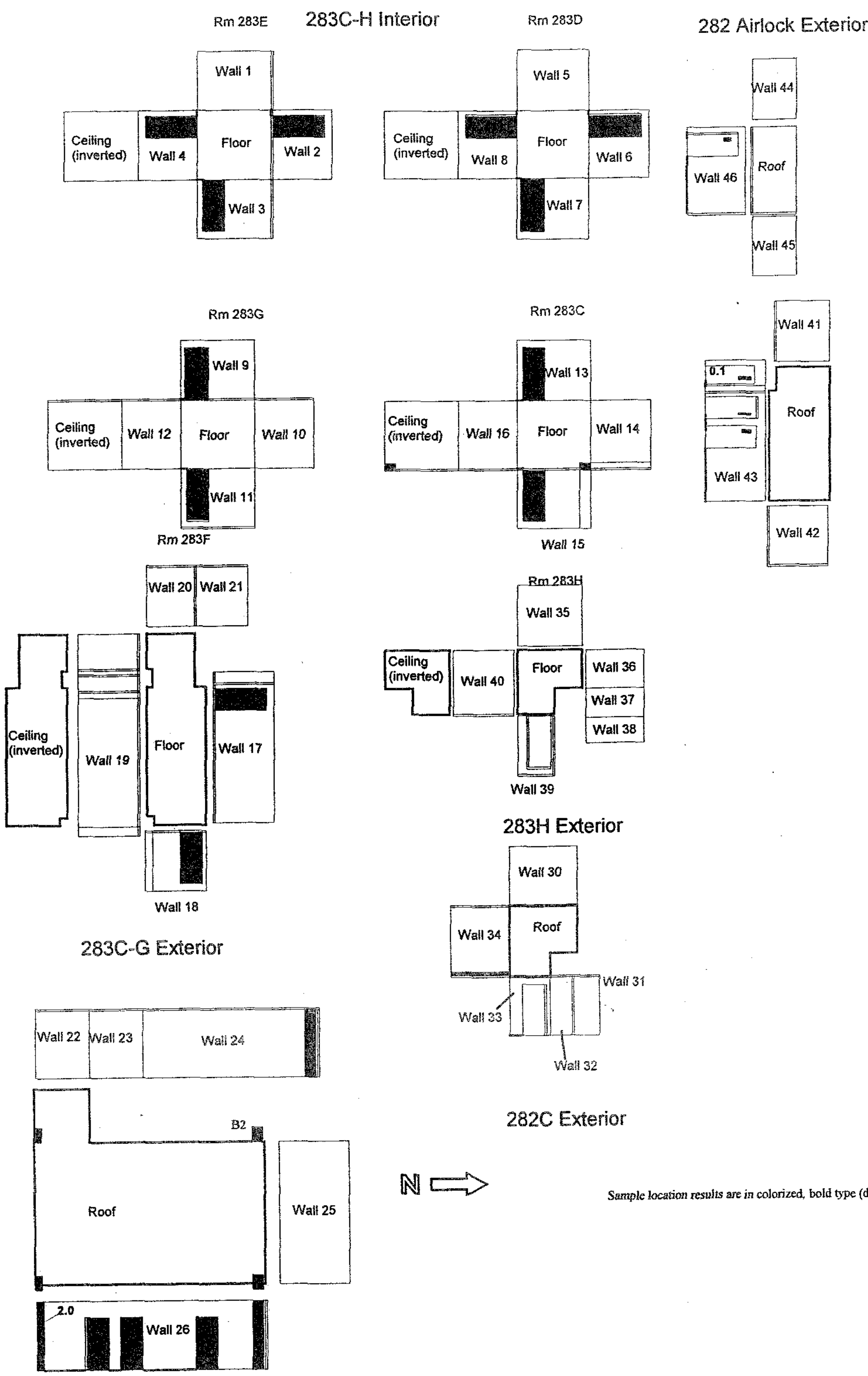
RADIOLOGICAL CLOSEOUT SURVEY FOR THE 771 CLUSTER

Survey Area: AH   Survey Unit: 771043   Classification: 2
Building: 771
Survey Unit Description: Rooms 283, 283A-J

Total Floor Area: 870 sq. m   Total Area: 4633 sq. m   Grid Size: N/A

SURVEY UNIT 771043 - MAP 5 OF 6



Sample location results are in colorized, bold type (dpm/100 sq cm)

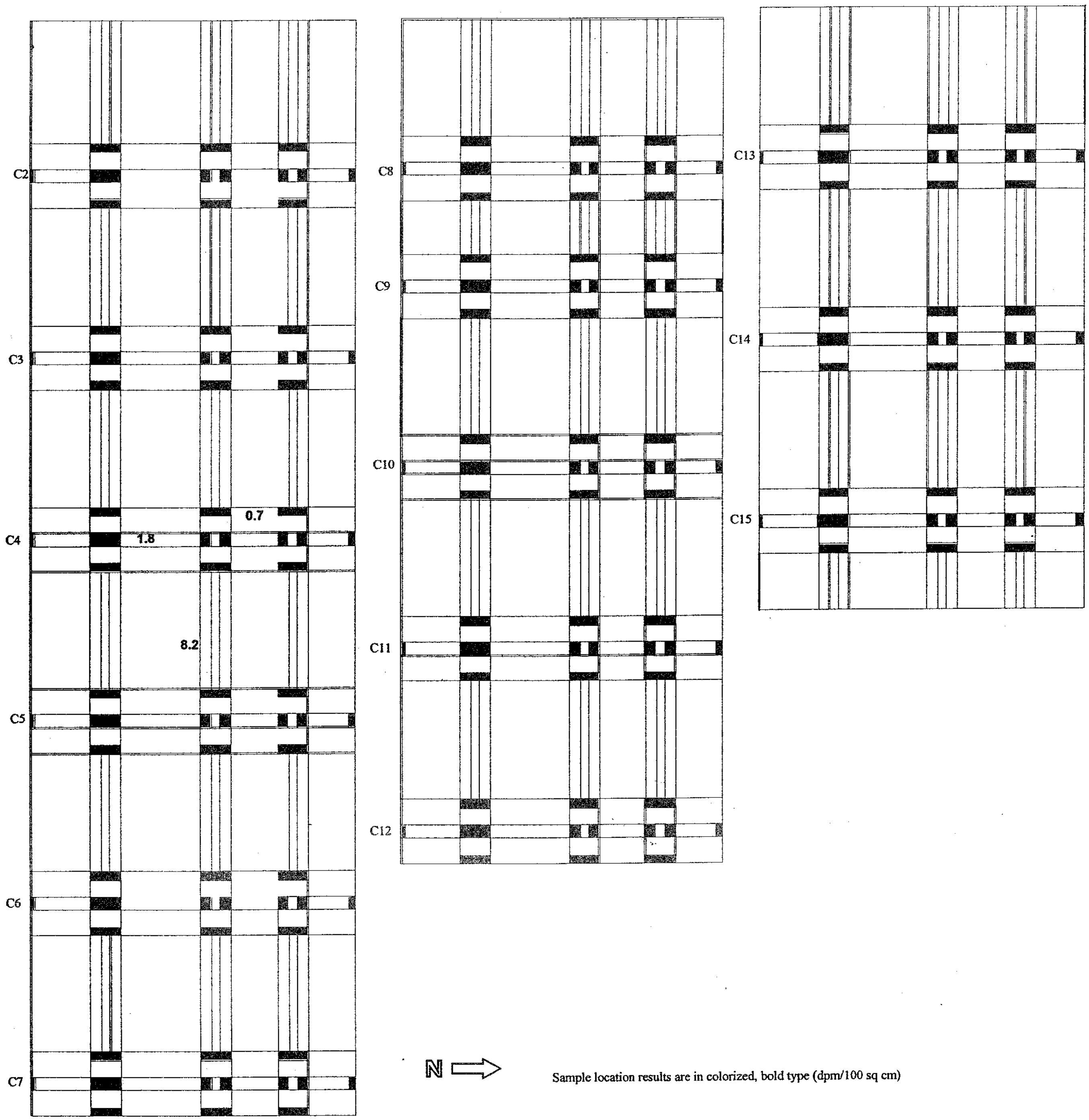
RADIOLOGICAL CLOSEOUT SURVEY FOR THE 771 CLUSTER

Survey Area: AH   Survey Unit: 771043   Classification: 2
Building: 771
Survey Unit Description: Rooms 283, 283A-J

Total Floor Area: 870 sq. m   Total Area: 4633 sq. m   Grid Size: N/A

SURVEY UNIT 771043 - MAP 6 OF 6

283 Ceiling (inverted)



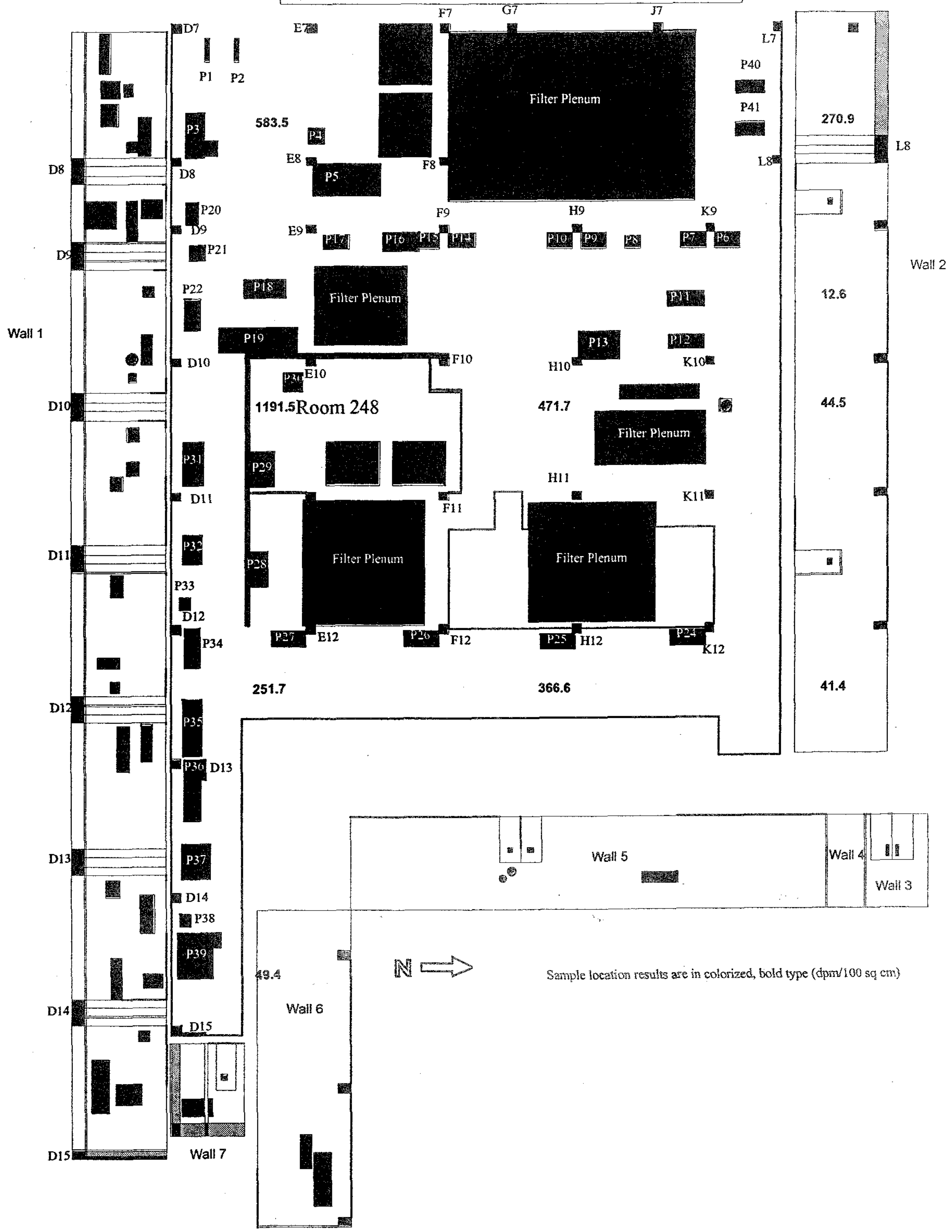
Sample location results are in colorized, bold type (dpm/100 sq cm)

RADIOLOGICAL CLOSEOUT SURVEY FOR THE 771 CLUSTER

Survey Area: AH **Survey Unit:** 771044 **Classification:** 2
Building: 771
Survey Unit Description: Room 249 East

Total Floor Area: 661 sq. m **Total Area:** 2787 sq. m **Grid Size:** N/A

SURVEY UNIT 771044 - MAP 1 OF 3



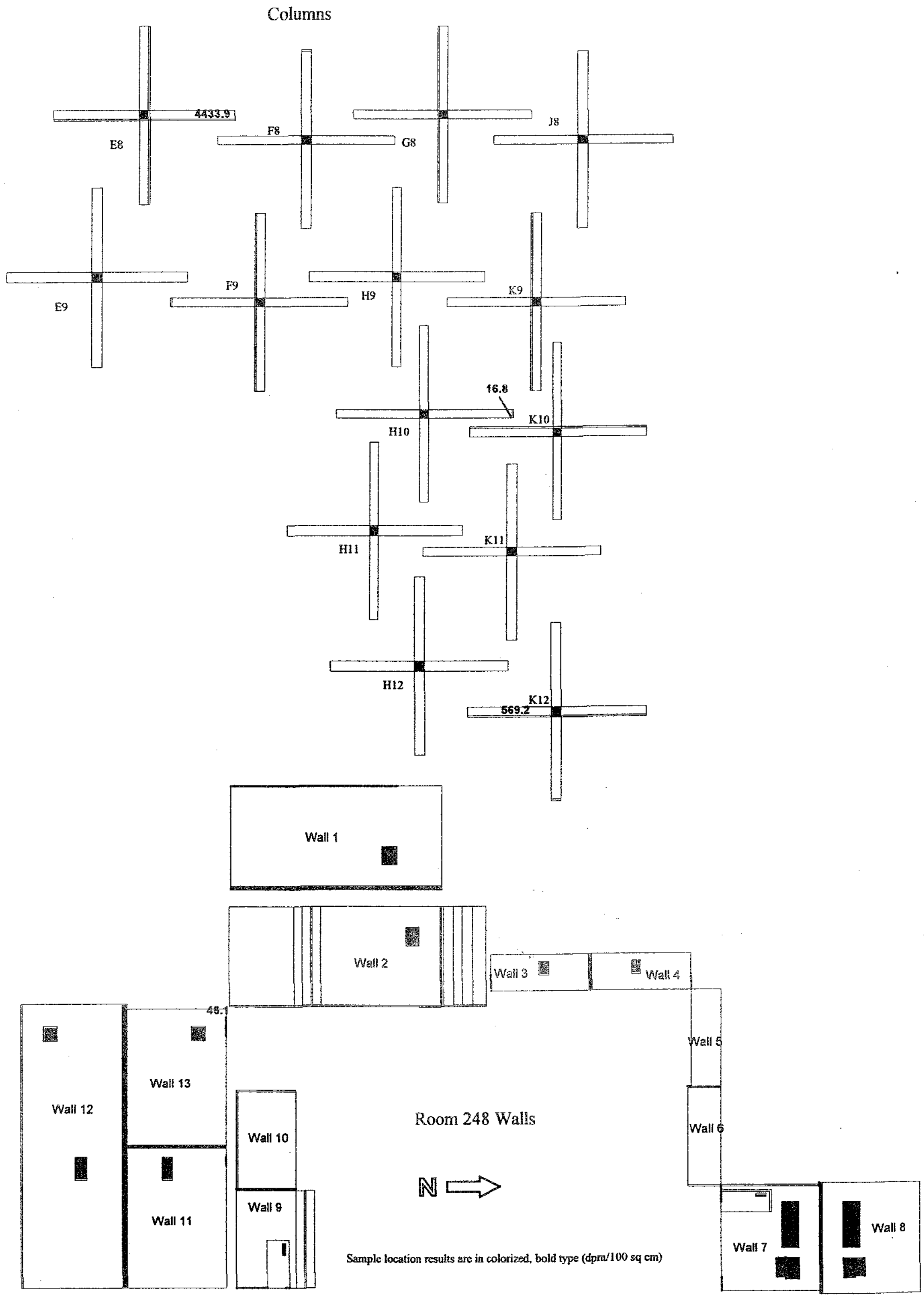
Sample location results are in colorized, bold type (dpm/100 sq cm)

RADIOLOGICAL CLOSEOUT SURVEY FOR THE 771 CLUSTER

Survey Area: AH　　Survey Unit: 771044　　Classification: 2
Building: 771
Survey Unit Description: Room 249 East

Total Floor Area: 661 sq. m　　Total Area: 2787 sq. m　　Grid Size: N/A

SURVEY UNIT 771044 - MAP 2 OF 3



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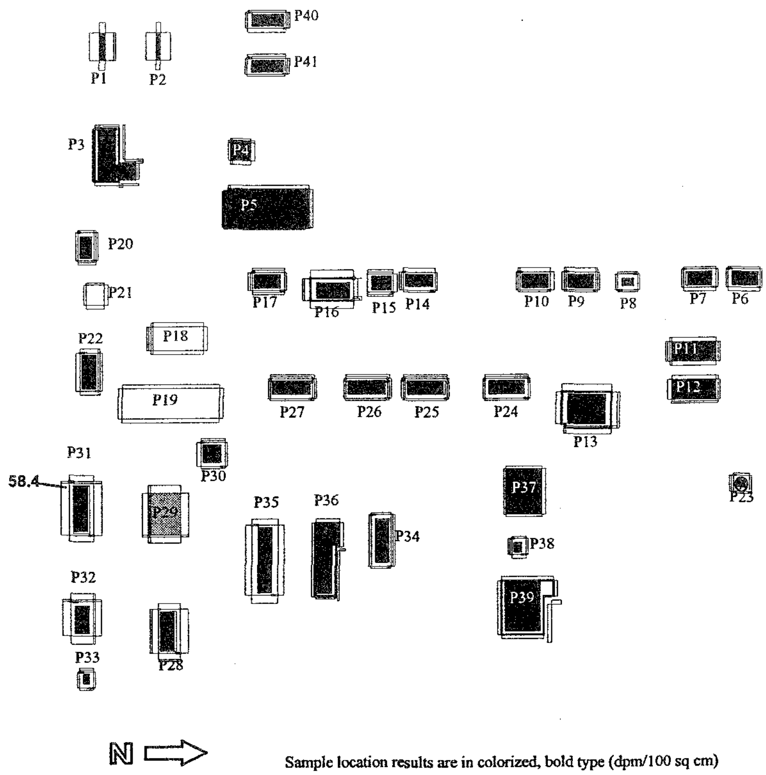
RADIOLOGICAL CLOSEOUT SURVEY FOR THE 771 CLUSTER

Survey Area: AH **Survey Unit:** 771044 **Classification:** 2
Building: 771
Survey Unit Description: Room 249 East

Total Floor Area: 661 sq. m **Total Area:** 2787 sq. m **Grid Size:** N/A

SURVEY UNIT 771044 - MAP 3 OF 3



Sample location results are in colorized, bold type (dpm/100 sq cm)

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RADIOLOGICAL CLOSEOUT SURVEY FOR THE 771 CLUSTER

Survey Area: AM **Survey Unit: 771051** **Classification: 2**
Building: 774
Survey Unit Description: 774 Rooms 103, 101, 201
Total Floor Area: 78 sq. m **Total Area: 490 sq. m** **Grid Size: N/A**

SURVEY UNIT 771051 - MAP 1 OF 1

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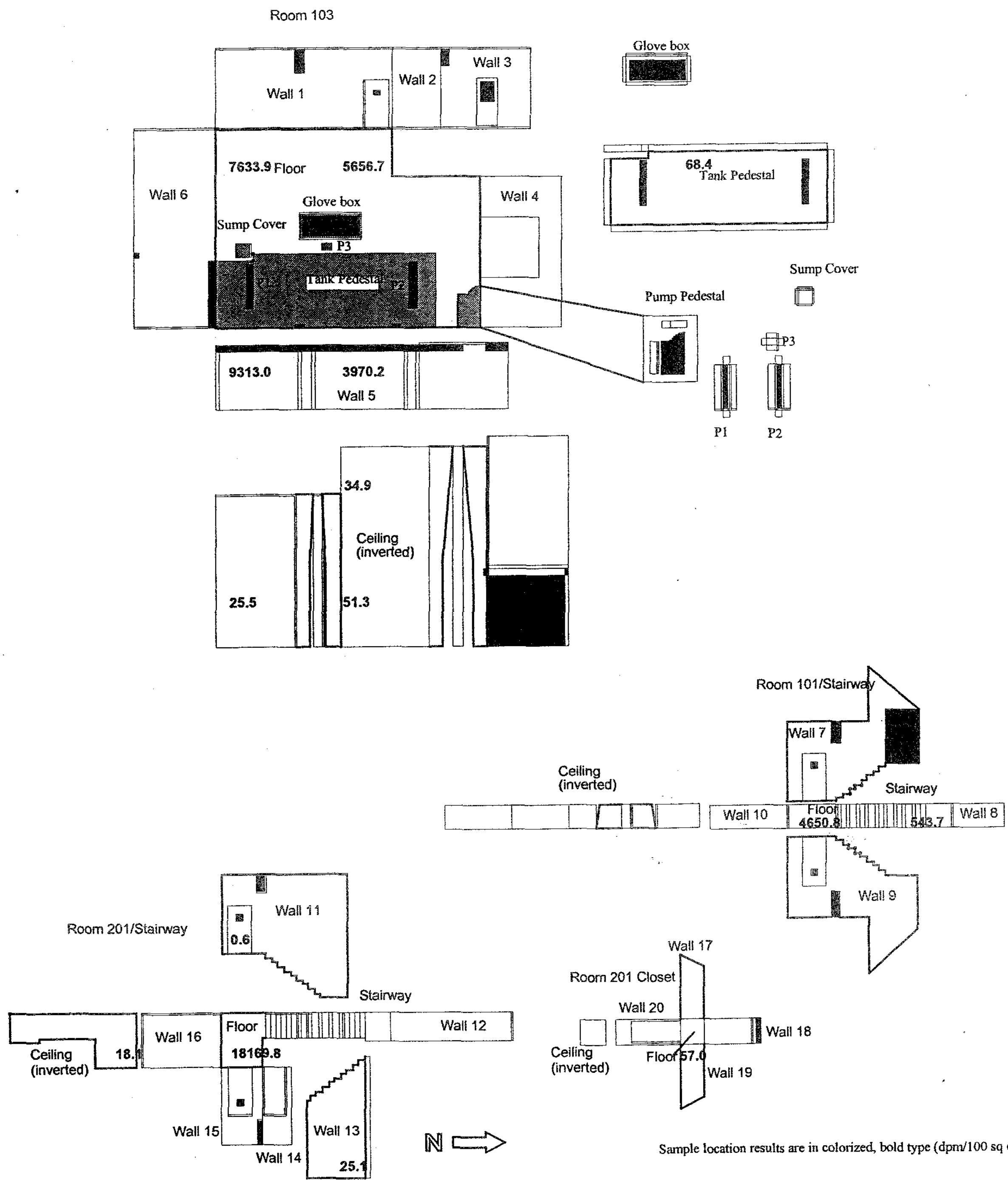


Sample location results are in colorized, bold type (dpm/100 sq cm)

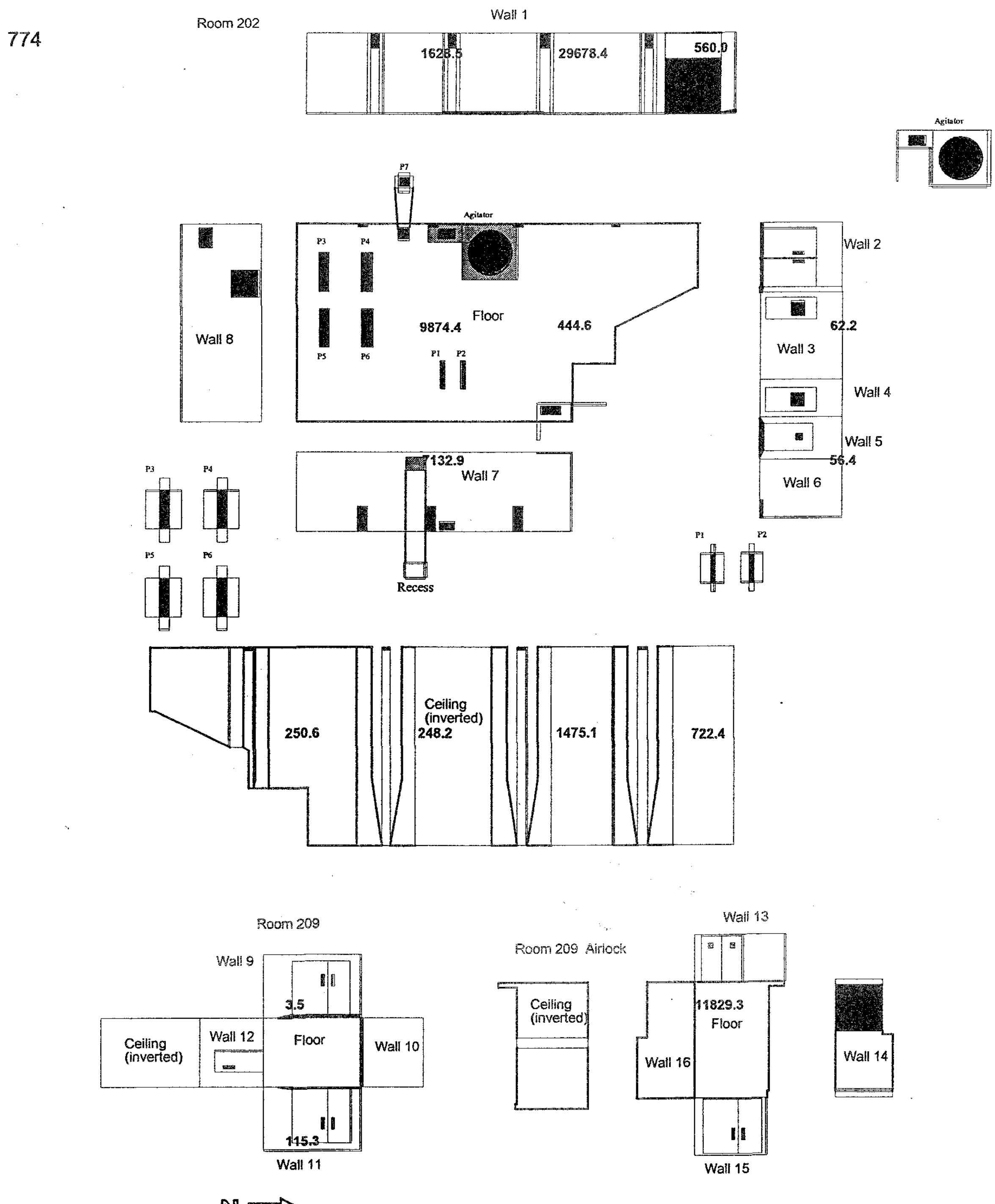
97

RADIOLOGICAL CLOSEOUT SURVEY FOR THE 771 CLUSTER

Survey Area: AM **Survey Unit:** 771052 **Classification:** 2
Building: 774
Survey Unit Description: 774 Rooms 202, 209,

Total Floor Area: 149 sq. m **Total Area:** 620 sq. m **Grid Size:** N/A

SURVEY UNIT 771052 - MAP 1 OF 1



Sample location results are in colorized, bold type (dpm/100 sq cm)

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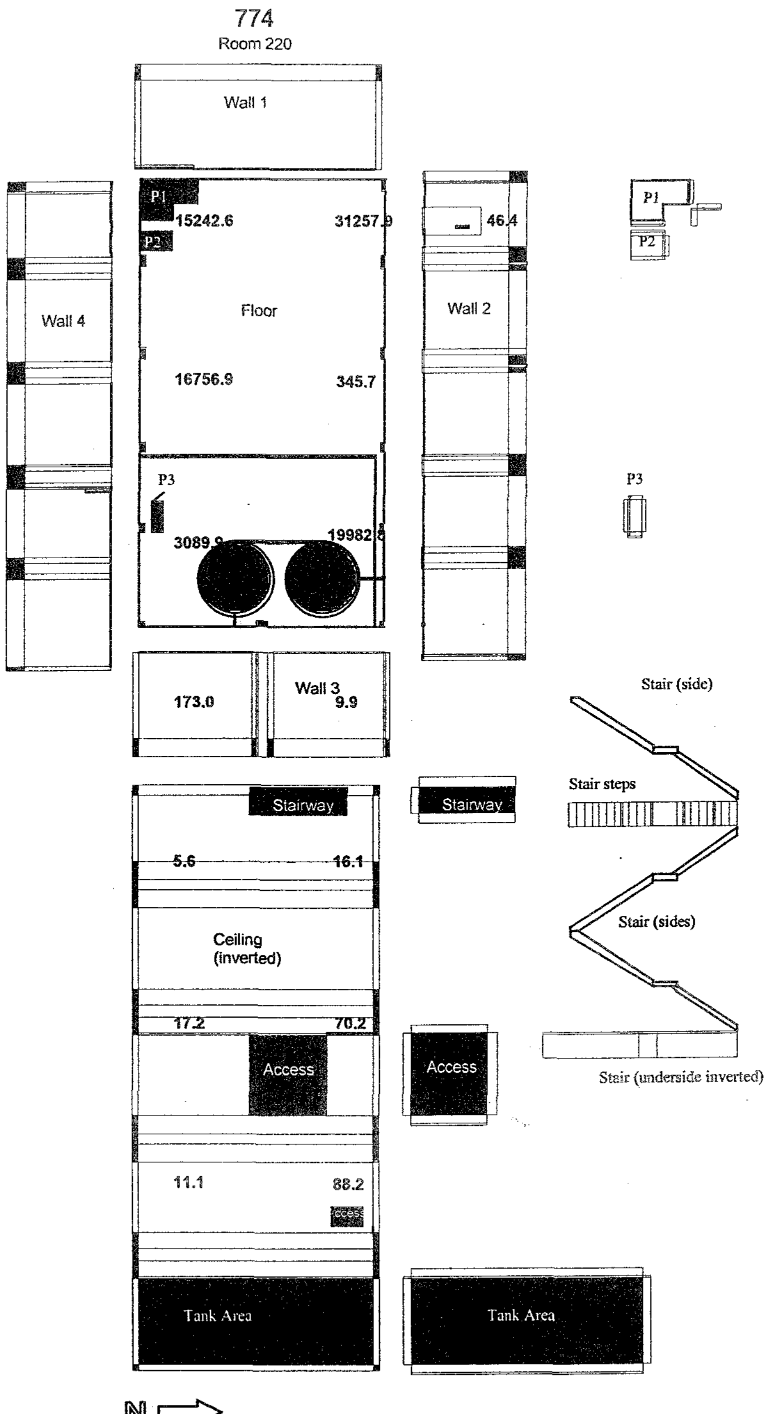
RADIOLOGICAL CLOSEOUT SURVEY FOR THE 771 CLUSTER

Survey Area: AM **Survey Unit:** 771053 **Classification:** 2
Building: 774
Survey Unit Description: Rooms 104, 105, 220

Total Floor Area: 138 sq. m *Total Area:* 617 sq. m *Grid Size:* N/A

SURVEY UNIT 771053 - MAP 1 OF 1



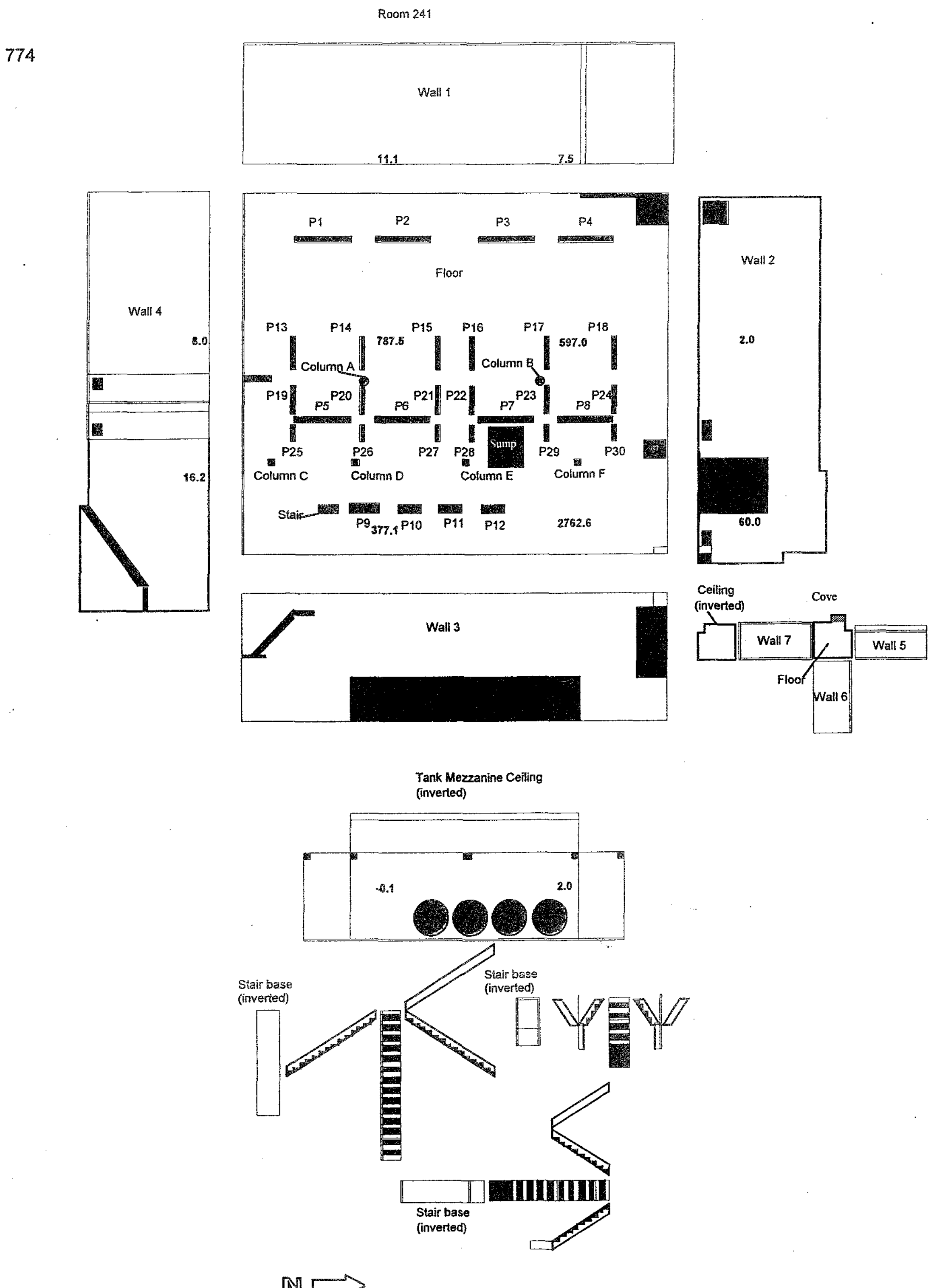
Sample location results are in bold type (dpm/100 sq cm)

RADIOLOGICAL CLOSEOUT SURVEY FOR THE 771 CLUSTER

Survey Area: AM   Survey Unit: 771054   Classification: 2
Building: 774
Survey Unit Description: 774 Room 241, 241 Ceiling

Total Floor Area: 278 sq. m   Total Area: 1083 sq. m   Grid Size: N/A

SURVEY UNIT 771054 - MAP 1 OF 2



Sample location results are in colorized, bold type (dpm/100 sq cm)

100

RADIOLOGICAL CLOSEOUT SURVEY FOR THE 771 CLUSTER

Survey Area: AM **Survey Unit:** 771054 **Classification:** 2
Building: 774
Survey Unit Description: 774 Room 241, 241 Ceiling

Total Floor Area: 278 sq. m **Total Area:** 1083 sq. m **Grid Size:** N/A

SURVEY UNIT 771054 - MAP 2 OF 2

Room 241 Ceiling

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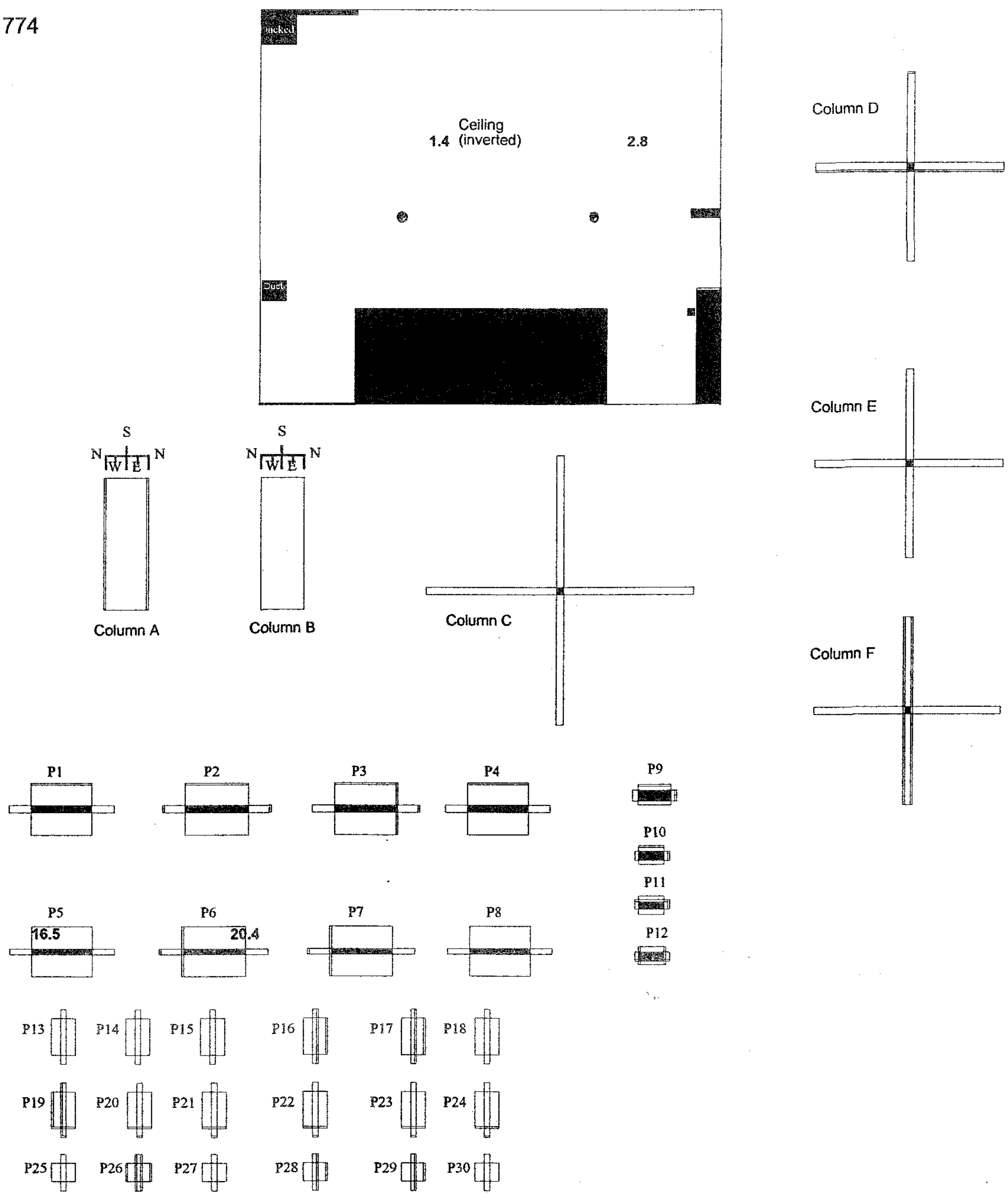

N

Sample location results are in bold type (dpm/100 sq cm)

RADIOLOGICAL CLOSEOUT SURVEY FOR THE 771 CLUSTER

Survey Area: AM **Survey Unit:** 771055 **Classification:** 2
Building: 774
Survey Unit Description: Rooms 320, 321, 322

Total Floor Area: 138 sq. m **Total Area:** 807 sq. m **Grid Size:** N/A

SURVEY UNIT 771055 - MAP 1 OF 2

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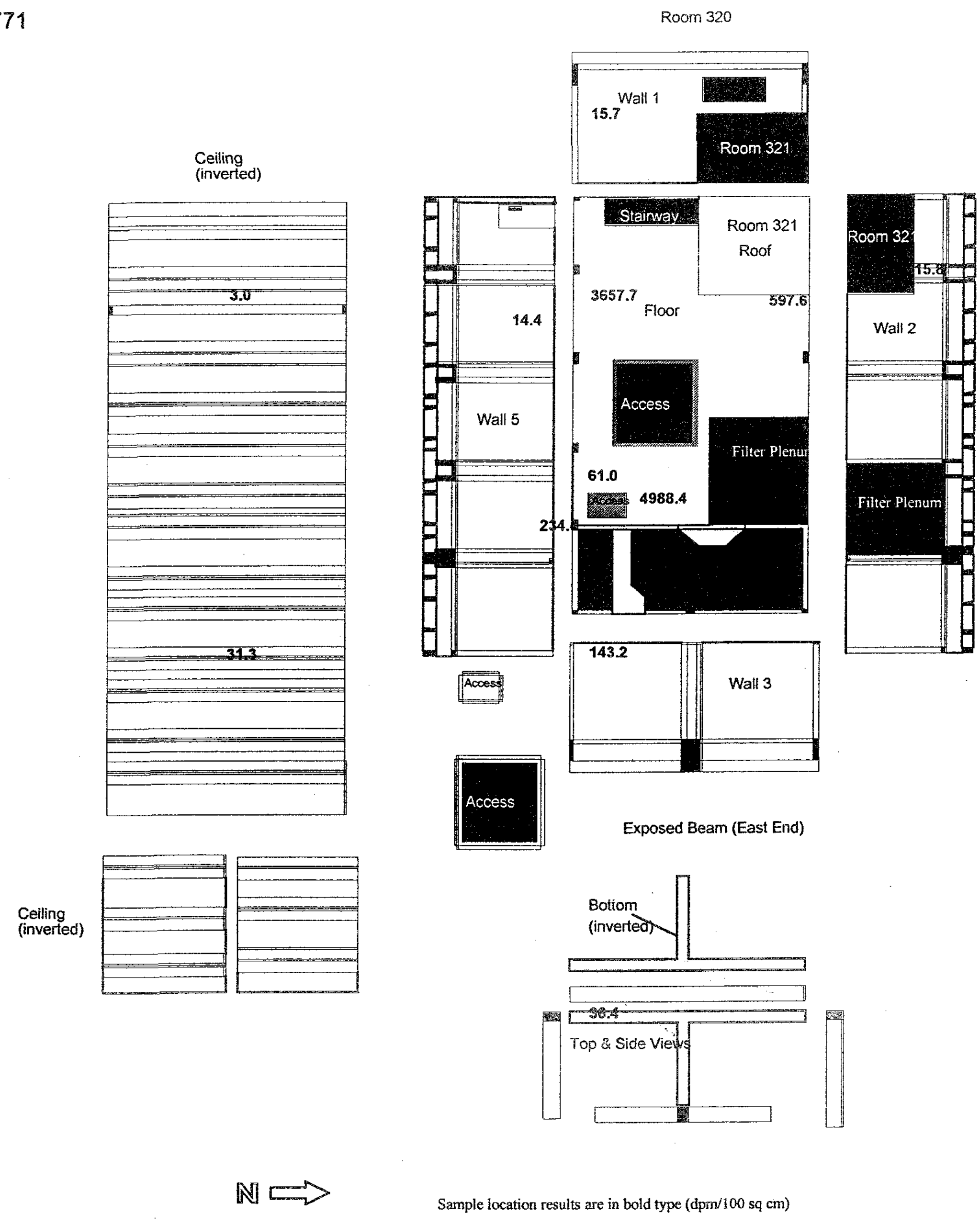

Sample location results are in bold type (dpm/100 sq cm)

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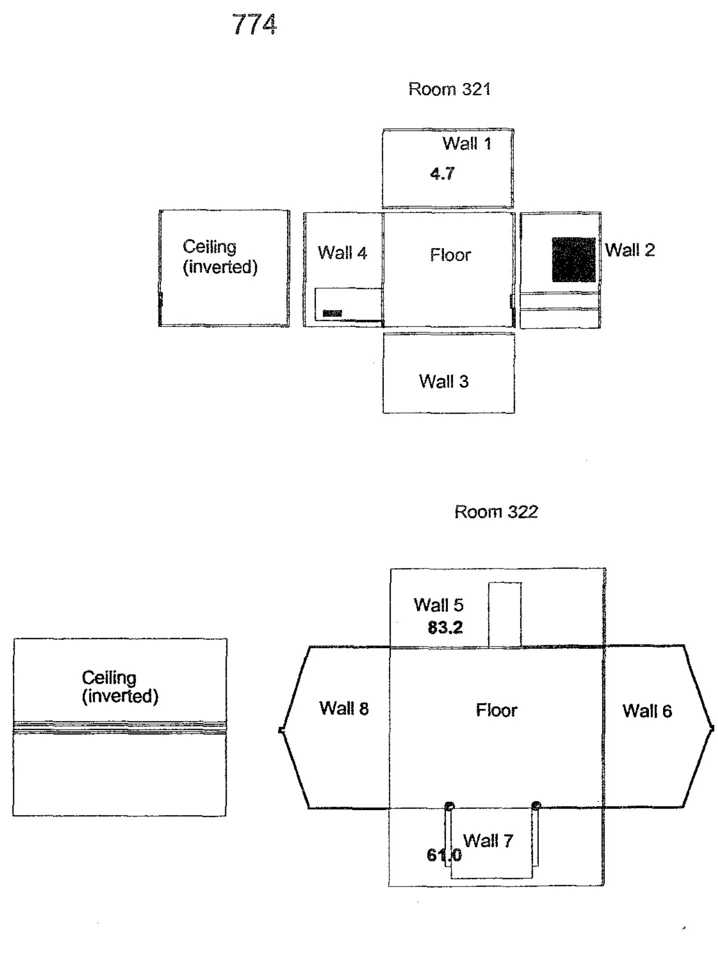
RADIOLOGICAL CLOSEOUT SURVEY FOR THE 771 CLUSTER

Survey Area: AM **Survey Unit:** 771055 **Classification:** 2
Building: 774
Survey Unit Description: Rooms 320, 321, 322

Total Floor Area: 138 sq. m **Total Area:** 807 sq. m **Grid Size:** N/A

SURVEY UNIT 771055 - MAP 2 OF 2



N

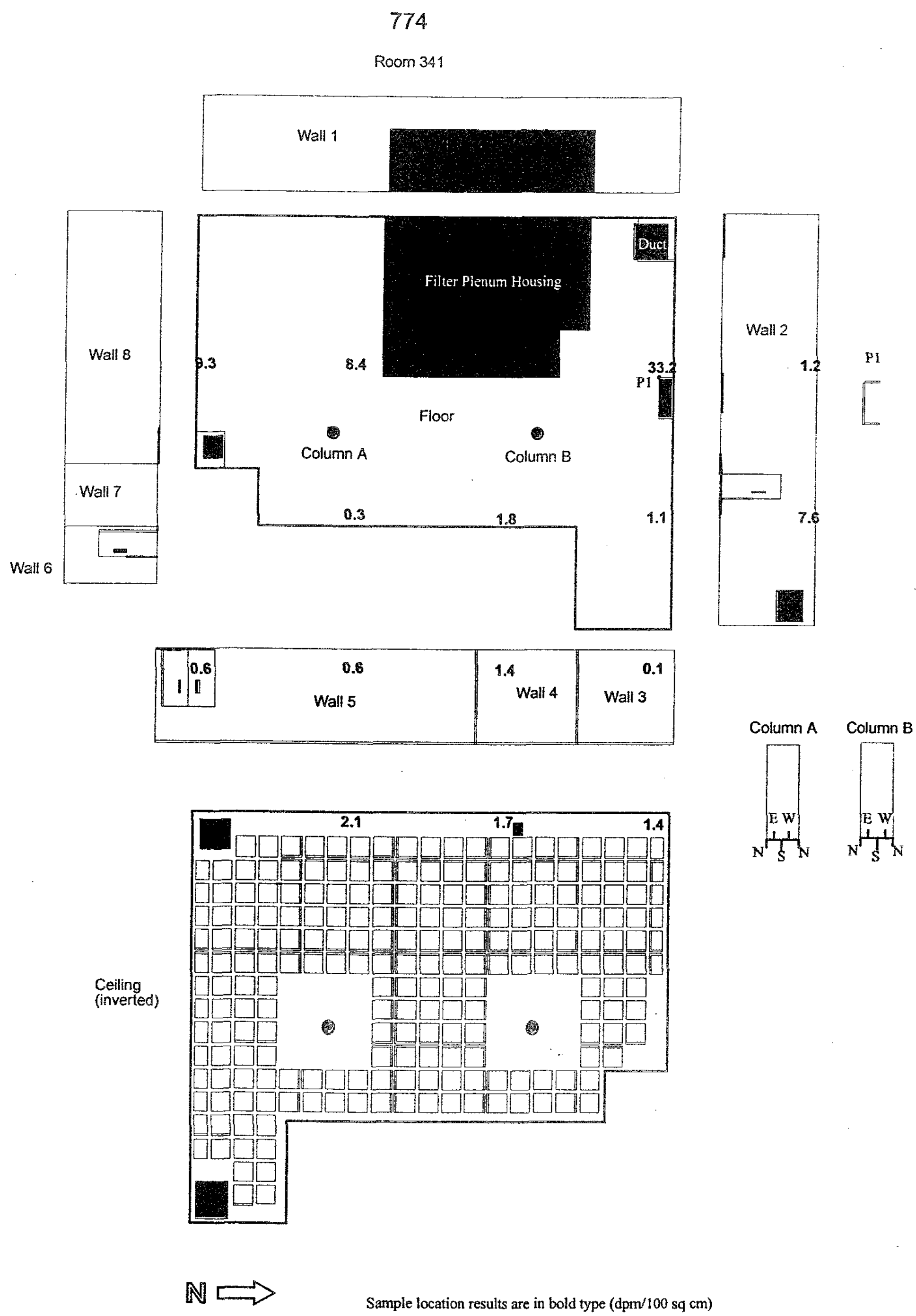
Sample location results are in bold type (dpm/100 sq cm)

RADIOLOGICAL CLOSEOUT SURVEY FOR THE 771 CLUSTER

Survey Area: AM **Survey Unit:** 771056 **Classification:** 2
Building: 774
Survey Unit Description: 774 Room 341

Total Floor Area: 187 sq. m **Total Area:** 687 sq. m **Grid Size:** N/A

SURVEY UNIT 77056 - MAP 1 OF 1



Sample location results are in bold type (dpm/100 sq cm)

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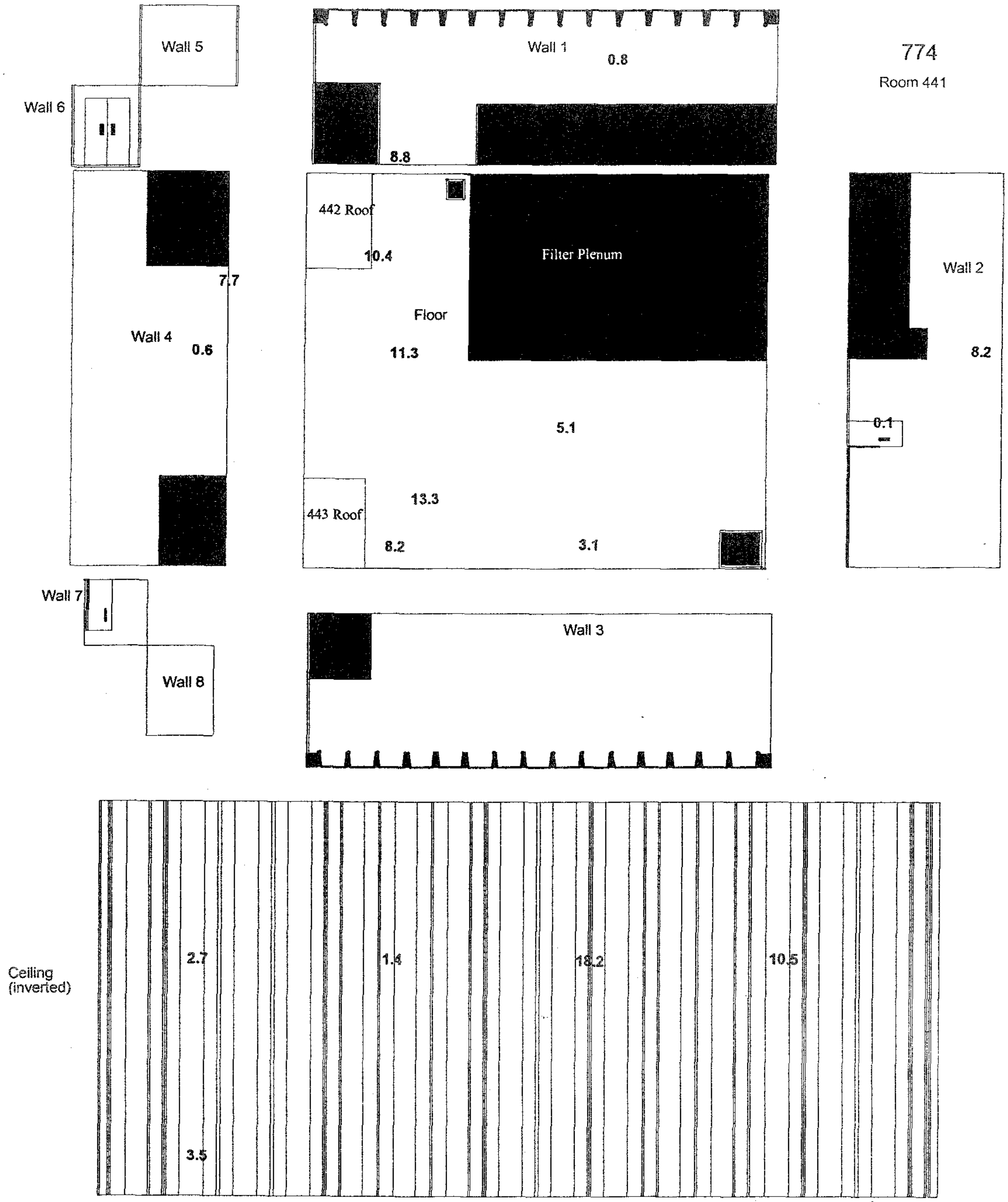
RADIOLOGICAL CLOSEOUT SURVEY FOR THE 771 CLUSTER

Survey Area: AM **Survey Unit:** 771057 **Classification:** 2
Building: 774
Survey Unit Description: 774 Room 441

Total Floor Area: 192 sq. m Total Area: 1156 sq. m Grid Size: N/A

SURVEY UNIT 771057 - MAP 1 OF 1



N ⇨

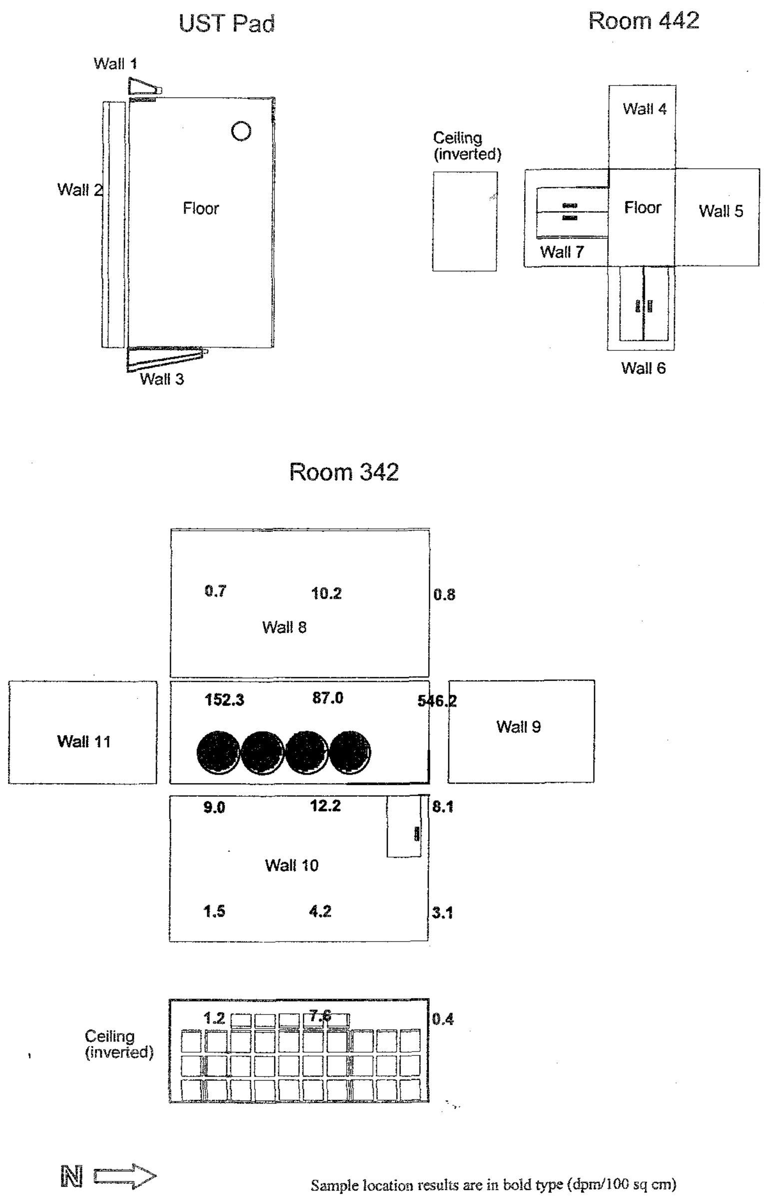
Sample location results are in colorized, bold type (dpm/100 sq cm)

RADIOLOGICAL CLOSEOUT SURVEY FOR THE 771 CLUSTER

Survey Area: AM **Survey Unit:** 771058 **Classification:** 2
Building: 774
Survey Unit Description: Rooms 342, 442, UST Pad

Total Floor Area: 89 sq. m **Total Area:** 331 sq. m **Grid Size:** N/A

SURVEY UNIT 771058 - MAP 1 OF 1



Sample location results are in bold type (dpm/100 sq cm)

ATTACHMENT C

771/774 Individual Hazardous Substance Sites (IHSSs) and Under Building Contamination (UBC)

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B771/B774 Individual Hazardous Substance Sites (IHSSs) and Under Building Contamination (UBC) Sites

There are fifteen to twenty IHSSs and two UBCs in and around the Building 771/774 Cluster, which are described below.

UBC 771 - Plutonium and Americium Recovery Operations

Building 771 housed the primary plutonium and americium recovery operations and was put into use in 1953. Several spills or releases have been documented:

- Trichloroethylene was used in October 1957 to clean and prepare concrete floors.
- A fire in 1957 resulted in infiltration along the edges of the building.
- A sewer line break in May 1968 at Building 771 resulted in a sewage lift station tank overflow and the release of low-level radioactive and chemical materials into the Building 771 outfall.
- Construction excavation in September 1971 between Buildings 771 and 774 exposed a tunnel that contained a process waste line. The exposed cracks in the tunnel were sealed and eight drums of soil were removed for offsite disposal in January 1972.
- During the routine inspection and servicing of Tank 469 in Room 149, plutonium-contaminated nitric acid flowed from a port into a pen and onto the floor. This incident occurred April 13, 1989, and resulted in the filing of a Resource Conservation and Recovery Act (RCRA) Contingency Plan Implementation Report (89-004).

UBC 774 - Liquid Process Waste Treatment

Building 774 housed liquid process waste treatment facilities. This building was put into use in 1953. Several spills or releases have been documented:

- In October 1956, a process waste tank overflowed.
- In August 1957, leaking process waste tanks resulted in minor environmental infiltration.
- In May 1979 the original Building 774 footing drain was located. It had rusted through on the bottom side.
- In October 1975, during excavation for a new sump pump in Room 102, contaminated soil with more than 1.5 million disintegrations per minute was encountered. Analytical results from a water sample collected on October 30, 1975, from the floor of Room 102 indicated 35,000 counts per minute (cpm).

IHSS 700-150.2 - Radioactive Site West of Buildings 771/776

- On September 11, 1957, a fire was discovered in Room 180 of Building 771. Fires in the box exhaust booster filters and main filter plenum were discovered soon after. An explosion in the main exhaust duct probably contributed to the release of plutonium from the stack. The September 1957 fire in Building 771 released radioactive contamination primarily north and southwest of the building. In September 1957, during firefighting and decontamination activities at Building 771,

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access to the main filter plenum was gained through a hatchway on the western side of the building. This activity was the main cause of the spread of contamination on the western side of Building 771 at the time of the September 1957 fire.

- On May 11, 1969, a fire occurred in Building 776/777. Plutonium was tracked outside of Building 776 by fire fighting and support personnel and was detectable on the ground around the building. Contamination was confined to an area approximately 20 feet by 100 feet and west of the building. Another source states that the contaminated area extended from the southern wall of Building 778 to the northern wall of the maintenance addition to Building 776, in a strip approximately 30 feet wide along the western wall of Building 776. Following the fire, rain carried the contamination into the soil. Airborne contamination from the May 1969 fire was carried predominantly to the west-southwest, the average wind direction at the time. Contamination was found outside the building to a maximum of 200 feet following the fire. Soil and asphalt removed from the western side of Building 776 contained 7 disintegrations per minute per gram (dpm/g) when analyzed in August 1969. Contamination was from Pu. In May 1971, a study of the steps, dock, and ramp areas on the western side of Building 776 indicated radioactive contamination as high as 6,000 cpm.

- In June 1969, an estimated 320 tons of asphalt and soil contaminated by plutonium at the time of the May 1969 fire were removed and buried in the trenches. In December 1969, contaminated soil and asphalt were removed from behind Building 776 to fill an area east of Building 881 (PAC 9000-130). In May 1971, contaminated steps, dock, and ramp areas on the western side of Building 776 were covered with an epoxy paint. Areas of contamination outside Building 776 were covered with asphalt. In June 1980, contaminated asphalt was removed from the western side of Building 776 and boxed as hot waste.

IHSS 700-163.1- Radioactive Site 700 North of Building 774 (Area 3) Wash Area

- IHSS 163.1 was originally defined as a 6-foot by 150-foot area northwest of Building 774 (EG&G 1990a). Based on evaluation of available information, the Operable Unit (OU) 8 RCRA Facility Investigation/Remedial Investigation (RFI/RI) Work Plan indicated the boundary was approximately 50 feet by 125 feet.

- It was reported that an area north of Building 774 was used for washing equipment and vehicles contaminated with radioactive materials (DOE 1992a), and a former Rocky Flats Plant employee recalled that clean up of trucks occurred near the dock at the northeastern corner of the building (DOE 1994a). Reportedly, personnel would use nitric acid, soap, and water for cleaning, and the solution would flow onto the ground. The wash water may have contained low levels of unspecified radionuclides, nitric acid, and various organic and inorganic compounds. However, Building 774 personnel did not recall this area ever being used to wash equipment or vehicles (DOE 1992a). In addition, washing down a piece of equipment or vehicles where wash water would come in contact with the asphalt or ground surface would have been against Rocky Flats Plant policy. Decontamination of vehicles was reportedly performed by wiping the surfaces with kimwipes and monitoring until the surface was clean (DOE 1004a). There was no resulting wash water.

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- The area encompassed by IHSS 163.1 could have been impacted by IHSS 149.1, which was a break in a process waste transfer line. The Bowman's Pond area was impacted and the process waste would probably have flowed over IHSS 163.1.
- The western half of the IHSS is mostly flat, paved, and covered in part by Trailer T771G. The eastern half is unpaved, slopes to the north, and is crossed by an access road to the Solar Evaporation Ponds (EG&G 1990a).
- Results of the Radiometric Survey performed at Rocky Flats from 1977 through 1984, indicated no radioactivity above background levels northeast of Building 774 (DOE 1992a). There are no wells or boreholes within, adjacent to, or downgradient of IHSS 163.1.
- A foundation drain constructed of 4-inch-diameter polyvinyl chloride (PVC) is located on the southern side of the eastern addition to Building 774. This foundation drain connects to a 6-inch-diameter corrugated metal pipe storm drain at the southeastern corner of the east addition to Building 771 and runs southwest to northeast through IHSS 163.1. The outfall for this storm drain is located on the hillside northeast of Building 774 at sampling station FD-774-3. This outfall has never been sampled and is usually dry. Discharge from the outfall collects in the OU 4 drain system where it is then treated.

IHSS 700-163.2 - Radioactive Site 700 Area 3 Americium Slab

- IHSS 163.2 was originally defined as a 50-foot by 50-foot area north of Buildings 771 and 774, outside of the Protected Area and southeast of Parking Area No. 71 (EG&G 1990). However, additional information indicated that this IHSS is an area approximately 60 feet by 40 feet near the eastern end of Trailer T771A.
- Reportedly, an Am-251-contaminated concrete slab, approximately 8-feet square by 10 inches, is buried in the area near Building T771A. Between 1962 and 1968, the slab served as the foundation for a 5,000-gallon stainless steel tank located approximately 30 feet north of Building 771. The tank was part of the Filtrate Recovery Ion Exchange system that concentrated Am-241 and Pu-239/240 for recovery. The Am-241 and Pu-239/240 were concentrated on an ion exchange column and then transferred to the tank. The resulting liquid contained in the tank was a nitrate solution high in Am-241 content with some Pu-239/240 (DOE 1992a).
- In approximately 1968, a leak developed in the valve/piping on the bottom of the tank and some of the contents dripped onto the concrete slab. The flanges in the area of the leak were tightened, and the valve and piping were wrapped with plastic and yellow tape. The tank was emptied through the processing of the contained solution. The leakage of the radioactively contaminated liquid is not believed to be a chronic event, but rather a one-time occurrence. Once the tank was emptied, it was removed from service, and taken to the size reduction facility in Building 776 (DOE 1994a). When the tank was removed, the slab was decontaminated, with respect to removable contamination, until smear samples did not detect removable radioactivity. The slab was then painted to secure the fixed radioactivity. Following this decontamination effort, the slab was reportedly moved to a ditch or low area

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north/northeast of the former tank location and probably buried. In the late 1970s, Building T771A was constructed in the same general area. Reportedly, there was no subsequent excavation of the slab, and the slab is believed to be underground near or beneath the eastern end of Building T771A at a depth of less than 10 feet.

- The incident was not recorded as an environmental incident impacting soil at Rocky Flats in a 1973 environmental summary report. However, the report does note the slab on a map of the area north of Building 771, in an area farther north of where the slab is believed to be buried. It also states that it was later excavated and the contaminated portion cut away for offsite disposal. This is not believed to be the case because the area shown on the map was paved several years before the slab became contaminated. Also, there is no verification that the slab was subsequently excavated (DOE 1994a).
- There is no mention of contaminated soil being buried with the slab. However, it is possible that a small amount of soil from beneath the slab was deposited when it was pushed into the ditch (DOE 1994a).

IHSS 700-215 - Abandoned Sump Near Building 774 Unit 55.13 T-40

- The concrete mixed waste storage tank adjacent to Room 103 of Building 771 was constructed in 1963. The roof of the tank serves as the floor of Room 203. The tank held sludge from second state precipitation of liquid process waste from Building 771. Also stored was effluent from a silver recovery unit in Building 774. Use of Tank T-40 ceased when the tank was replaced in September 1989. No documentation was found that details releases from this unit.

IHSS 700-139(N)(b) - Hydroxide Tank, KOH, NaOH Condensate

- The potassium hydroxide (KOH) tank is located south of Building 771. This is an aboveground tank that has a capacity of 5,400 gallons and has been diked since before 1973. There was an overfill of the KOH tank prior to 1973. As a result of this incident, it is likely that the caustic seeped through the soil and infiltrated beneath the building. During the week ending May 5, 1978, another spill occurred. This spill occurred during a routine filling operation and was contained by the dike surrounding the tank. On November 13, 1989, the KOH tank was overfilled. Approximately 5 gallons of liquid spilled onto an earthen berm that surrounds the tank.
- In response to the November 1989 overfill of the tank, approximately 100 pounds of "oil dry" were used to absorb the KOH within the bermed area. Contaminated soil and oil dry were removed and placed into drums. The Fire Department HAZMAT team verified the contamination was adequately cleaned up by taking soil samples and performing pH tests. Additionally, a RCRA Contingency Plan Implementation Report (89-020) was completed.

IHSS 700-124.1 - 30,000-Gallon Tank (68), IHSS 700-124.2 - 14,000-Gallon Tank (66), and IHSS 700-124.3 - 14,000-Gallon Tank (67)

- Tanks 66 and 67 are identical in size (14,000 gallons capacity), construction, and age, and they share an internal wall. Tank 67 is immediately south of Tank 66.

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- Tank 68 is located 2 feet south of Tank 67 (30,000 gallons capacity). Tank 68 was built in 1958. The walls of all three tanks are approximately 10-inch-thick reinforced concrete, although the exact dimensions of Tanks 66 and 67 are different from Tank 68.
- In July 1981, Tank 66 overflowed, spilling an estimated 500 gallons of liquid waste. A second source states that during the week ending July 17, 1981, approximately 3,300 gallons of process waste water overflowed a tank in Building 774, and approximately 50 gallons ran onto the asphalt driveway. Another source states that this spill involved between 50 to 100 gallons of liquid which contaminated the ground east of Building 774.
- The released process wastewater contained high concentrations of nitrate and was contaminated to about 40,000 disintegrations per minute/liter (dpm/l) plutonium. Another source states that the liquid released in the overflow incident was high in nitrate, contained plutonium and uranium, and was measured at approximately 30,000 dpm/l. An analytical report on the process wastewater released from the July 1981 Tank 66 spill indicated total alpha activity at 7.8×10^4 picocuries per liter (pCi/l), total beta activity at 4.6×10^4 pCi/l, nitrate at 5.6×10^3 milligrams per liter (mg/l), and a pH of 12.
- The area east of Building 774 was paved following the overflow of Tank 66 in 1981. The contamination may not have been removed prior to paving. A sitewide radiometric survey was performed from 1977 to 1984. The purpose of the survey was to identify surface areas extremely contaminated with radioactivity (500,000 to 1,000,000 pCi/g).
- In September 1989, all three tanks were taken out of service in compliance with closure regulations. No documentation was found that further details a response to the occurrence.

IHSS 700-126.1 - Westernmost Out-of-Service Process Waste Tank, IHSS 700-126.2 - Easternmost Out-of-Service Process Waste Tank

- Tank 292/A/West, aka T-8 (west) and Tank 293/B/East, aka T-8 (east) are process waste tanks were built in 1952 and are housed in Building 728 below grade. The tanks were in operation between 1953 and the late 1950's when the two tanks were taken out of service. Since being taken out of service, in approximately 1984 the tanks have been converted to contain fire suppression deluge overflow for the Building 771 Plenums. Each of the tanks has an operating capacity of approximately 20,000 gallons and a maximum design capacity of 25,000 gallons. Since being taken out of service in 1984, the tanks have been converted to contain fire suppression deluge overflow for Building 771 plenums. The tanks leak, allowing groundwater to periodically flow into the tanks; the groundwater is then pumped into the process waste system.
- These tanks overflowed several times prior to 1956. Information gathered during the Comprehensive Environmental Assessment and Response Program (CEARP) interviews suggest that the tanks may have leaked during use.

- The combined exterior tank dimensions are 33 feet 6 inches (east-west) by 23 feet, 5 inches (north-south) and are 11 feet 8 inches long. The ceiling and wall thickness are 10 inches and the floor thickness is 1 foot. The tanks share the inner wall. The bottom elevation of the tanks' interior is at 5,931 feet. The tanks were designed with a minimum cover of 3 feet of fill except for the area overlain by the building. The original design indicated that two pipes enter each tank from the south. The invert elevations of the pipes where they enter the tanks are 5,939 and 5,938 feet. The volume of material that could remain in the tank below the level of the outlet pipe is unclear from the design drawings. The tanks had stored laundry water from the Building 771 laundry facility which ceased operations in the late 1950s. The tanks are sometimes referred to as laundry tanks.
- The pumphouse (Building 728) is a concrete structure situated directly above the tanks with dimensions of 14 feet 10 inches (east-west) by 7 feet 10 inches (north-south) and is 7 feet 6 inches high. The southern wall of the pumphouse is above the southern wall of the tanks. It contains the manholes for access into the tanks, one sump pump for each tank, and one sampling point into each tank. The pumphouse is partially underground and does not appear as large as its dimensions indicate. Liquid process wastes likely contained trace amounts of nitrate, plutonium, uranium, and various other organic and inorganic constituents which would washed into the tanks from the Building 771 Plenums via deluge water.
- Tanks 292A and 293B reportedly fill with groundwater periodically, surface water also reportedly runs into Building 728 during periods of high runoff.

IHSS 000-121 Tank 12 - OPWL - Two Abandoned 20,000-Gallon Underground Concrete Tanks

- Information describing the two tanks, Tank T-12 West and Tank T-12 East has not yet been found. The IHSS/PAC location maps show these two tank to be located underground below the building 771 Cafeteria and Shower/Locker Trailer T-771C. Process knowledge information indicates at one time the two tanks received liquids from the Building 771 process area floor drains and liquids from the Building 771 foundation/footing sump pump drains.

IHSS 700-139.2 - Caustic/Acid Spills Hydrofluoric Tank

- IHSS 139.2 is related to two horizontal 1,300-pound hydrofluoric cylinders, each with a 1,200-pound capacity, which are located in Building 714. Building 714 is a small shed approximately 4 feet east and 29 feet south of the southeastern corner of Building 771. Hydrofluoric acid had reportedly infiltrated the soil in the vicinity of the storage area. Numerous small spills and leaks are reported to have occurred during routine filling and transfer operations. The hydrofluoric acid is delivered in portable tanks that replace the empty tanks, thus requiring no open transfer. These portable tanks are sealed cylinders. The acid is piped to, and used in, Building 771. The area is flat, includes both paved and unpaved surfaces, and is heavily used. A large aboveground KOH storage tank is immediately east of the site (DOE 1994a).
- In May 1971, a leak in a hydrofluoric connection outside Building 771 was reported. A small amount of vapor was released but no personnel exposures occurred. No further details of this incident are available (DOE 1994a).

- During the week ending August 13, 1976, a hydrofluoric acid leak above Building 771 was repaired. Apparently the hoses had collected small amounts of the acid that appeared when the line was pressurized (DOE 1994a).
- A portable, refillable, nitric acid dumpster is located at the southeastern corner of Building 771, just north and west (approximately 25 feet) of the hydrofluoric acid storage area discussed above.
- According to Supervisor Investigation Report #87-7-771.1 - Acid Spill, there was a release of approximately 35 gallons of 12-normal nitric acid at the dumpster on July 1, 1987. The cause was a leak in the supply hose. Neutralization was attempted by the use of KOH flake and sodium bicarbonate. The following day, the soil was loosened and more sodium bicarbonate was added. An asphalt layer was discovered approximately 6 inches below ground surface. The affected soil was removed to hazardous waste unit number 1 or IHSS 203. New road mix was to be placed on the asphalt pad (DOE 1994a).
- IHSS 139.2 was originally defined as a 40- by 60-foot area that encompassed the hydrofluoric shed south of Building 771. The information compiled on IHSS 139.2 for the HRR (DOE 1992a) indicated the location presented in the Interagency Agreement (IAG) was inaccurate. For the OU 8 RFI/RI Work Plan, it was proposed that the location of IHSS 139.2 be redefined to represent the location of the hydrofluoric storage shed (Building 714). This is approximately 350 feet south and 250 feet west of the location presented in the IAG as IHSS 139.2 (DOE 1994a). More recent information indicates IHSS 139.2 should be located approximately 45 feet south of the southeastern corner of Building 771 and its boundaries reduced to approximately 25 by 35 feet.
- There are no monitoring wells located immediately downgradient of this IHSS (DOE 1994a). The nearest downgradient monitoring wells are approximately 210 feet northeast of IHSS 139.2 and are immediately downgradient of IHSS 137.
- There are no foundation drains or storm drains in IHSS 139.2. However, a 6-inch tile foundation drain runs along the southern wall of Building 771. This foundation drain appears to run under where the nitric acid dumpster is located at the southeastern corner of Building 771. This foundation drain is part of the entire Building 771 foundation (and roof drain) system. This drain system eventually discharges to Manhole #3 near the northwestern corner of Building 771.

IHSS 700-146.1 - Concrete Process 7,500-Gallon Waste Tank (31), IHSS 700-146.2 - Concrete Process 7,500-Gallon Waste Tank (32,) IHSS 700-146.3 - Concrete Process 7,500-Gallon Waste Tank (34W), IHSS 700-146.4 - Concrete Process 7,500-Gallon Waste Tank (34E), IHSS 700-146.5 Concrete Process 7,500-Gallon Waste Tank (30), and IHSS 700-146.6 - Concrete Process 7,500-Gallon Waste Tank (33)

- Six underground process waste holding tanks were located south of the original Building 774. Building 774, a liquid waste processing facility, has been modified

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several times since its construction in 1952. During the construction of a southern addition in 1972, the tanks were removed. These tanks overflowed frequently.

- IHSS 700-146 represents a six-chambered reinforced concrete structure south of Building 774. The chambers of the structure are referred to as Tanks 30, 31, 32, 33, 34W, and 34E. Tanks 30 and 33 have a 3,000-gallon capacity. The others have 6,000-gallon capacities. The tanks were included in a 1952 engineering drawing, but it is unclear when they were first placed into service. Liquid waste was transferred to or from the tanks through pipes connected with the original process waste lines. Manholes were located at the top of each chamber. The walls of the tanks were approximately 10 inches thick. The bottom elevation was approximately 5,955 feet and the tanks were 11 feet 8 inches high. The area occupied by the tanks was 22.5 feet (east-west) by 32.5 feet (north-south). The floors of the tanks were at the same approximate height as the second floor of Building 774. Ground elevation south of the tanks was approximately 5,965 feet. The ground surface south of Building 774 slopes steeply to the north and levels out near the top of the tanks. RFP Drawing 1-5392-74 locates the six tanks immediately west of Tanks 66, 67, and 68, discussed in IHSS 700-124 and PAC 700-125.
- In October 1956, the process waste tanks at Building 774 overflowed resulting in minor environmental infiltration. In August 1957, some of the tanks leaked, resulting in minor environmental infiltration with levels up to 2,500 dpm/g that was cleaned up. One of the overflows reportedly flowed down the eastern road toward North Walnut Creek.
- Minor leakage from the six tanks was suspected to have been the cause of contamination found in footing drain water north of Building 774.
- The process wasted stored in the tanks was an aqueous solution containing plutonium, uranium, acids, and caustics. Water from the Building 774 footing drains contained levels as high as 500 dpm/l. Approximately 200 cubic yards of soil removed from around the tanks contained contamination levels up to 2,500 dpm/g gross alpha activity. Another 60 cubic yards of soil removed averaged approximately 250 dpm/g.
- Excavation for the Building 774 addition construction began in February 1972. Contamination, resulting from the overflow of the tanks, was detected. At the time, the policy on waste disposal guidelines required that soil samples with levels in excess of 34 dpm/g plutonium activity be disposed of as contaminated waste. Radiometric monitoring procedures included an alpha survey meter evaluation of the site to be excavated. Readings in excess of 250 cpm required specific soil samples be collected for further analysis. Soil contamination in the excavation was identified as slightly below the 34 dpm/g limit, and by April 1972, 101 barrels of contaminated soil was reportedly shipped to Idaho Falls. It was estimated that 30 to 40 more barrels would follow.
- Demolition of the concrete tanks began on May 8, 1972. A wet saw cutting method was used for the removal of the tanks. The disposition of the concrete is unknown. Approximately 200 yards of contaminated soil were removed in 1972 at the time of decommissioning of the tanks and during construction of the southern addition to

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Building 774. The soil was piled north of Building 334 (PAC 300-156.1). The soil was then moved to the eastern end of the Triangle Area by June 1973 (PAC 900-165). Another 60 yards of soil removed from around the tanks was buried under 3 feet of fill dirt east of Building 881 (PAC 900-130). This soil averaged approximately 250 dpm/g (PAC 900-130).

- HRR information indicates that the tanks were located under what is now the southern wing of Building 774. It has been proposed to relocate and resize IHSS 146 based on the location of the tanks as shown in RFP Drawing 1-5392-74. The new location is immediately west of Tanks 66, 67, and 68. The location for this PAC in the IAG documents is currently too large and extends too far south and east. The size of the PAC has been decreased to correspond with the approximate dimensions of the tanks shown in engineering drawings, and correspond with the location at which the tanks had existed.

IHSS 700-150.1 - Radioactive Site North of Building 771

- IHSS 150.1 was originally defined as a 50-foot by 450-foot area north of Building 771 (EG&G 1990b). Information from the HRR (DOE 1992a) indicated waste storage and handling also occurred west of Building 770 and possibly north of Building 774. Due to a leaking tank incident in June 1968, it was proposed that the IHSS boundaries presented in the IAG be extended to the east approximately 120 feet. In addition, photographs show that in March 1974, more than 30 cargo containers were present immediately west of Building 770. It was proposed to extend the boundaries of IHSS 150.1 to include the area west of Building 770 (DOE 1992a). Therefore, the present IHSS 150.1 includes the area west of Building 770 and is an area approximately 360 feet by 60 feet immediately adjacent to the northern side of Building 771 (DOE 1994a).

- This IHSS consists of an area north of Building 771 affected by various radioactive leaks. The specific locations of these leaks were not recorded; however, the paved area north of Building 771 and west of Building 770 was used for storage probably as early as 1964. The storage area was bounded on the north by a fence that was parallel to Building 771 and extended north to enclose the western entrance of Building 770. The material stored was destined for plutonium content, and stored in drums on pallets or in cargo containers. The area encompassing this IHSS is paved, and occupied by numerous trailers, auxiliary buildings, and storage areas. A small prefabricated building used for storage is located west of Building 770 (DOE 1994a).

The primary incidents of spills and leaks include the following:

- In September 1957, a major fire occurred in Building 771. A plenum was breached releasing an unknown amount of radioactivity around the building, particularly to the north (DOE 1994a).

- Between 1962 and 1968, a 5,000-gallon stainless steel tank was located approximately 30 feet north of Building 771. The tank was used in the Filtrate Recovery Ion Exchange system, which concentrated plutonium and americium for recovery. In approximately 1968, a leak was discovered in the tank that dripped onto the concrete slab foundation. The tank was taken out of service and eventually

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disposed of offsite. The concrete slab was decontaminated, reportedly moved to a ditch area north of the IHSS, and buried (IHSS 163.2). The location of the tank was paved before 1969 (DOE 1994a).

- In June 1968, during removal of drums from the 903 Storage Area, a drum leaked on the roadway as it was being transported to Building 774. The forklift carrying the leaking drum traveled across the area north of Building 771 (DOE 1994a).
- The paved area between Buildings 771 and 770 was used for storage of residue in drums prior to processing in Building 771. A June 1969 photograph shows more than 100 drums stored in rows on the pavement. Drums were also stored in the area south of Building 770 between the access road and building. Building 770, located north of Building 771, was used as residue and equipment storage (DOE 1994a).
- In November 1970, residue leaked out of a drum of filters as it was being transported from a storage area to Building 771 for processing. The ground near the dock at Building 771, the transport truck, and a cargo container the drum came in contact with were all contaminated (DOE 1994a).
- In March 1971, it was noted that there was a significant increase in the number of "hot waste" drums stored in the area north of Building 771. The drums contained residues for the Building 771 incinerator (DOE 1994a).
- In June 1971, a leaking drum placed on the pavement contaminated approximately 115 square feet of asphalt. Soil and approximately 200 square feet of asphalt were removed for disposal. Shortly afterward, in July 1971, a leaking waste drum containing nitric acid from non-line-generated waste was discovered. A rainstorm spread contamination, impacting approximately 2,500 square feet of asphalt and gravel with 500 to 1,000,000 cpm of plutonium. It was determined that these two incidents in 1971 resulted in contamination of the area ranging from 100,000 to 300,000 dpm/100 square centimeters (cm^2) on the asphalt (DOE 1994a).
- In August 1972, a scrap box stored inside Building 770 was punctured and contaminated 3,600 square feet inside and 500 square feet outside the building. Levels of contamination ranged up to 200,000 dpm/cm^2. Affected asphalt and soil was removed immediately for offsite disposal (DOE 1994a).
- In September 1972, a drum containing spent ion exchange resin residue leaked inside Building 770 onto the concrete floor. Contamination was tracked between Buildings 771 and 770 and covered 600 square feet, including 50 drums and a forklift with contamination levels ranging from 5,000 and 100,000 cpm plutonium. The area was noted to be decontaminated (DOE 1994a).

No documentation was found that indicated any hazardous waste may have been associated with plutonium residue. However, decontamination activities would have focused on radioactive contamination, and it is likely that residual contaminants from hazardous constituents may have remained. The Building 771 area was used for storage until approximately 1974 when Building 776 was used for such storage. Building 770 was then used for storage of equipment and as a facility for equipment assembly prior to installation in other buildings (DOE 1994a).

Surface water in this IHSS generally drains to the west. The area immediately north of Building 770 has a grated collection channel that directs surface water to the east into a small pond (Bowman's Pond). The soil beneath the pavement is expected to be compacted fill material because the area had been a steep hillside sloping to the north before the area was leveled and buildings erected (DOE 1994a).

The results of a Sitewide Radiometric Survey performed during the late 1970s and early 1980s did not identify and extremely contaminated areas (500,000 to 1,000,000 pCi/g) north of Building 771 (DOE 1994a) Samples from a piezometer (p21989) installed in 1989 provided the following results:

- 1,1-Dichloroethane was detected at concentrations less than the method detection limit in several samples.
- Methylene chloride was detected in several samples, but blank contamination was indicated for those samples.
- Arsenic, barium, copper, iron, lead, magnesium, manganese, and zinc were detected at concentrations greater than background in surficial materials. Aluminum, arsenic, barium, chromium, iron, lead, magnesium, nickel, vanadium, and zinc concentrations exceeded background in bedrock samples.
- Activities of Am-241, Ra-226, Ra-228, tritium, U-233/234, and U-238 in samples of surficial materials, and Ra-226, Ra-228, and tritium in bedrock samples exceeded maximum background activities.
- A foundation drain constructed of 6-inch vitrified clay pipe runs along the northern edge of Building 771 and crosses the southwestern corner of IHSS 150.1 (DOE 1994b). This foundation drain discharges into Manhole No. 3 (proposed foundation drain sampling station FD-771-4), which is approximately 10 feet west of IHSS 150.1.
- A storm drain system containing a network of cast iron pipes is located beneath Building 771. The system presumably connects to the building roof drains and floor drains within the building. This system connects to a storm drain, constructed of 15-inch vitrified clay pipe, which runs east to west through the middle of IHSS 150.1. This storm drain also discharges to Manhole No. 3. Manhole No. 3 (FD-774-4) has not been an historical sampling location (DOE 1994b).

IHSS 700-150.3 Radioactive Site Between Buildings 771 and 774

- This IHSS consists of an area between Buildings 771 and 774 that contains a concrete tunnel. The tunnel was originally built as an exhaust ventilation duct for Building 774, but also contains process waste lines (DOE 1994a). IHSS 150.3 was originally defined as a 100-foot by 140-foot area east of Building 771 (EG&G 1990), but the IHSS boundaries were changed to include an area surrounding the entire tunnel. This change makes the IHSS an approximately 155-foot by 25-foot area with the eastern end extending up to the southwestern portion of Building 774.
- The ground surface above the tunnel has been modified as a result of construction and slope stabilization activities over the years. As a result, the tunnel is now

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partially exposed. Currently, the ground surface slopes steeply to the north to a retaining wall approximately 10 feet high, which was constructed adjacent to the northern wall of the tunnel. The area north of the retaining wall, the Building 771/774 courtyard, is flat and paved. The western portion of the hillside is covered with approximately 3 inches of spray foam, overlain with chicken wire. It is assumed that the foam and wire are for slope stabilization and erosion control. South of the IHSS, the area is relatively flat and mostly paved (DOE 1994a).

- In August 1971, leaks into Building 771 at the western end of the tunnel were attributed to releases from the process waste lines where the pipes entered the building through the wall. Also in August 1971, contaminated soil was removed from beneath the tunnel. It is unknown whether the soil removal was a response to the leaks into Building 771 (DOE 1994a).
- In September 1971, continued construction exposed more of the tunnel and three cracks in the concrete walls were found contaminated. This incident reportedly released plutonium into the soil. As a result, the contaminated cracks were sealed and eight drums of soil with approximately 24 dpm/g activity were removed for offsite disposal. Samples of wastewater from the pipelines indicated activity of 1,000 pCi/L (the type of radiation detected was not specified). Soil samples from the area were found to be slightly contaminated (DOE 1994a).
- In the late 1970s or early 1980s, personnel recall an incident when the flange on a process waste line separated, releasing an unspecified amount of aqueous process waste that reached the surface. The area was reportedly cleaned up (DOE 1992a).
- A piezometer (P219189) constructed in 1989 in alluvium is located downgradient of this IHSS. The nearest wells south of this IHSS are P209289, an alluvial monitoring well, and P209389, a bedrock monitoring well. Based on water table maps, these wells may be upgradient of a portion of IHSS 150.3.
- A storm drain, constructed of 18-inch corrugated metal pipe, runs east-west through IHSS 150.3 in the Building 771/774 courtyard. Two additional storm drains, of like construction, connect to the east-west drain within IHSS 150.3 and run north, discharging at outfalls near the southeastern corner of Building 770 in IHSS 172. There are two catch basins for this storm drain system located within IHSS 150.3.
- An 8-inch corrugated metal pipe foundation drain was added along the southern and western walls of an addition on the southern side of Building 774. As a result, the foundation drains for Building 774 may discharge to the storm drain discussed above. The outfall at sampling station FD-774-1 is the discharge pipe for this storm drain (DOE 1994b). Results of historical sampling at FD-774-1 indicated that gross alpha and/or gross beta was detected at levels exceeding background for nearly every sampling event between June 1979 and December 1989. Tritium was detected at levels exceeding background during sampling events in March, June, and September 1980, and September 1981.
- Surface water and sediment sampling location SED07895 is adjacent to IHSS 150.3. This sampling location is located at the outfall of the storm sewer at the base of the

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IHSS 150.3 tunnel. This is also the discharge point for some of the Building 774 foundation drains and has been historically sampled as location FD-774-1.

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